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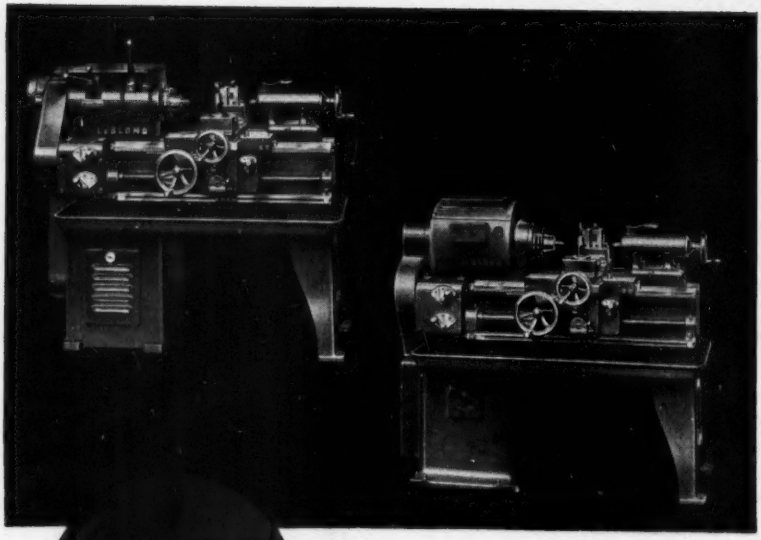

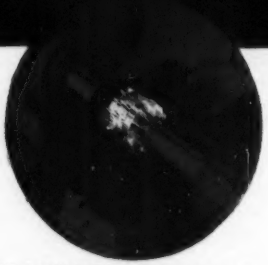

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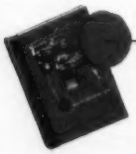

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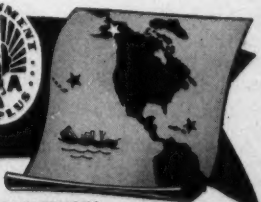

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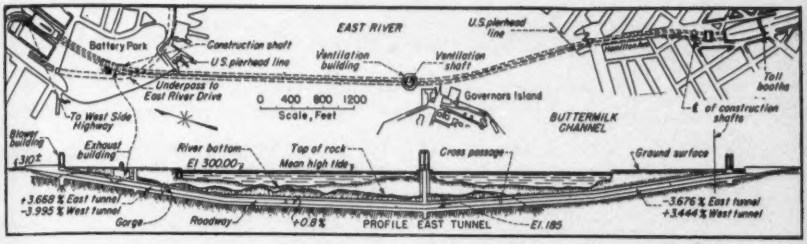


Plan and cross-sectional views of Brooklyn-Manhattan tunnel (twin vehicular), showing smooth approach for traffic.

Twin-Tunnel Engineering

Express highway tunnels, each carrying one traffic lane, are driven separately but simultaneously. Pioneer tunnel made, then enlarged to 31 ft. dia.

To connect express highways in Brooklyn and Manhattan, a 2-way, 2-lane, express vehicular tunnel is under construction beneath East River, New York. The two tunnels, of 31-ft. dia., are being driven simultaneously. Tubes and covered approach sections are 9,117 ft. long, giving smooth, direct alignment with the connecting traffic arteries.

The tunnel passes through rock formations of the Manhattan schist, a micaceous formation, except for a small rock gorge at the Manhattan end that extends down to about the level of the tunnel invert and for a short distance near the Brooklyn end where the tunnel is in soft, stratified silt and clay for about 2,800 ft. Grades from pierhead lines are 3.7% ascending and 5% descending.

Tunnel will be cast-iron lined for its full length. Rings are constructed of 14 cast iron segments and a key. Ring length is 31 in., reducing caulking, bolts, and shielded shoves. In soft ground, heavy cast iron linings, with 14-in. flanges, weighing 22.7 tons per ring, are held by 1¼-in. bolts. In rock, the lining has 11-in. flanges, weighs 12.5 tons per ring, and is held by 1⅛-in. bolts.

Lining is caulked with asphalt-impregnated cotton gaskets and lead wire. Lining will carry a minimum 2-in. layer of concrete on the inside face. Vehicular tubes will be lined with ceramic tile; roadway will be brick paving. Fresh air will be brought in by ducts under roadway and distributed by flues above curbs. Exhaust ports are located in ceiling.

Construction plan called for a 24 x 24-ft. pioneer tunnel, later to be enlarged to full diameter. This gave added rock cover during blasting of face excavation. In finish blasting, this procedure caused less disturbance to covering rock.

From shaft, rock excavation for bottom drift was started with blast holes drilled from short jumbos. Shooting was with delay exploders; mucking was with tunnel shovel tilted to feed onto belt conveyor to 5-cu. yd., side-dump muck cars. As gorge was approached, a concrete bulkhead with air locks was placed across each tube. Soft ground was supported by poling boards, driven over caps and outside of supports of timber bents. After gorge was passed, construction continued in free air.

Enlargement of the tunnel was worked from the inside and toward the entrance. Ten 3½-in. drifter drills mounted on a rail carriage drilled holes for delay exploding.

—ENGRG. NEWS-RECORD

Camera Becomes Factory Tool

Time and money can be saved by printing layout and templet drawings on material to be cut and by scores of other applications

Functional photography has scores of uses in metalworking, and will have more as shop men realize the time and money savings which can be made directly in their work. It reduces templet-making time as much as 90%, prints fabricating instructions direct on metal, helps to speed up machines and refine processes. The field of contour machining is being broadened by photography. Tool engineers find that photographs of chart-gage images aid in production research and tool development. Plant layout is being done with much less engineering labor through application of photography. Design costs less when replicas of standard-part drawings are applied to assembly layouts of custom-engineered equipment. Photographic records of nondestructive tests are being used to improve products.

Design, Fabrication—As a time-saving, inexpensive, and accurate means of reproducing drawings in the same, reduced, or enlarged scale, photography has many applications:

1. Templet photography, used for aircraft and now being applied by designers of automobile bodies and streamlined trains, as well as parts and tools that require lofting to produce correct contours at important cross sections.
2. Sensitized work layouts on sheet or plate to be bent, sheared, drilled, or torch cut.
3. Low-cost name plates, wiring diagrams on control boxes, decorative panels, instrument dials.
4. Revitalizing of tracings.
5. Production of high-contrast black-line on white photographic prints of drawings for file or permanent reference.
6. Custom-engineered designs around standard parts by placing photo prints of standards in position on the drawing and connecting with necessary details.
7. Preparation of plant layout boards upon which planning engineers erect three-dimensional models.
8. Enlarged templets for use with machine tools that shape, route, or grind forms or contours. Also templets for optical comparators or contour-measuring projectors.
9. For layout of castings by projecting datum lines and hole centers from photographic masters.

Drawings can be printed on a sensitized metal surface to provide complete details for shearing, bending, torch cutting, drilling, and other operations.

Sensitizing, Printing—A water emulsion may be sprayed on the templet stock or a transfer paper can be laminated or cemented to the surface. Spray emulsion requires the least equipment for application, can be applied to any size of sheet. Transfer papers are light-safe until the paper covering is stripped from thin film of emulsion.

In projection printing, drawings as large as 5x10 ft. are photographed in reduced size on glass negatives by huge cameras. After development, the negative is projected by the camera or special projector onto sensitized sheet metal. Except for smaller templets, this process is costly because of equipment involved, but it perhaps is the most versatile application.

In contact printing, a loft drawing

must be made on transparent material, either coated glass or processed vinylite. Then drawing is placed in a contact frame with a sensitized vinylite material and exposed. After development, the intermediate negative is printed on sensitized metal.

Reflection printing can be used if a metal loft drawing is preferred and same-size templets suffice. A negative is made on glass (max. convenient size about 4x6 ft.) to which photographic copy paper has been laminated, or on a vinylite white-base film. Emulsion side of negative material is placed in contact with loft drawing, and exposure is made by cumulative effect of light passing through back of film or glass plate and being reflected back onto the emulsion. The negative so made may be printed on templet stock.

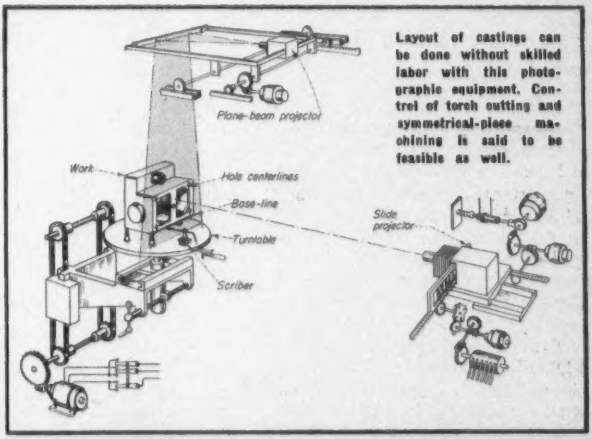
X-ray incited luminescence also can be used in printing. Very large drawings are reproduced sharply in templet stock by the use of luminescent drawing boards. The metal loft, preferably aluminum, is primed, painted with a black guide coat and then with a phosphorescent material. The drawing is made on the last material with India ink or pencil and excited briefly with x-rays.

Then the glowing board is placed in contact with an x-ray negative. After development, the negative is clamped in contact with sensitized templet stock. This produces a properly oriented black line-on-white replica.

Inspection, Machining — Great strides in layout, machining, contour work are being made through the use of templets enlarged 10 to 100 times. Photography is essential to: (1) Make durable tracer-control diagrams. (2) Duplicate exactly a master layout when making charts for optical comparators and contour-measuring machines. (3) Record the image seen on optical-comparator chart, when errors in tools must be corrected.

Three-dimensional Layout—For laying out intricate castings, General Electric Co. has developed a machine that replaces skilled men. The work is put on a turntable, adjusted for height by motor drive and for lateral position by handwheel and screw. Drawings of the article, from several views, are photographed in reduced size upon plates. One at a time is projected onto the workpiece. The plane of true projection and correct dimensions are established by a plane-of-light projector. This device, operating in conjunction with the slide projector under selsyn motor control, projects a plane-like beam downward onto the work, the beam coinciding with one face of the casting for scribing—to take an example—the baseline and centerlines for several holes.

Additional Applications—Other functional applications of photography in industry are: (1) Microfilming drawings and documents for easy, compact filing



Layout of castings can be done without skilled labor with this photographic equipment. Control of torch cutting and symmetrical-piece machining is said to be feasible as well.

and quick reference. (2) use of high-speed cameras to study the performance of machine parts at operating speeds. (3) Production of motion pictures for employee training and product promotion purposes. (4) Time and motion study with the aid of motion pictures. (5) Pictorial operation sheets which easily are understood by machine and assembly operators. (6) X-ray photographs for inspection. (7) Photomicrographs for metallurgical studies. (8) Stress analysis by photoelectric and lacquer techniques.—AMERICAN MACHINIST

Economics Favor Gas Turbine

Indicated costs are lower than for steam plant in isolated service, as transmission line booster, and as base load plant

All power-system engineers should give serious consideration to gas turbines. If they do not, many good opportunities to achieve minimum-cost power will be overlooked.

To date, 12 commercial power-producing gas turbines have been built or are on order. All operate at modest inlet-air temperatures and use alloy materials standard before the war. This demonstrates that there are definite places in the stationary power filed where the gas turbine's inherent characteristics prove very suitable.

Present economic capacity range for gas turbines using 1100°F. gas varies from 1,000 to 25,000 kw. When inlet gas temperatures can be raised, the range will increase. Reports from Switzerland indicate that investments in gas turbine plants are 10 to 15% less than for comparable-size high-efficiency steam plants. Only about one-third as much building volume is required as for steam plants, and operating labor is considerably less. The turbines can be started when cold in 6-10 min., eliminating banking losses and minimizing starting losses. Combustion chambers are easy to maintain; turbine and compressor repairs are comparable to steam-turbine maintenance.

Typical performance at full load for 10,000-kw. gas turbines are: simple cycle, no intercooling, 19,000 Btu. per kwh.; with one intercooler, 16,000 Btu.; 2-turbine arrangement with intercooler, 15,000 Btu.; regenerative cycle with intercooling and reheating, 13,000 Btu. Plants built for 30% thermal efficiency cost about 50% more than for 20% efficiency.

In isolated service, calculated costs for 10,000-kw. steam and gas turbine plants favor the latter. Turbine investment ammounting to 91 to 98% of that for an 800-psi., 950°F. steam plant is economically permissible, yet Swiss experience places the actual percentage at 85-90%. Peak-load plants, however, profitably can be applied only to systems already operating at high levels of efficiency.

For a base-load plant, a regenerative gas turbine is calculated to be more economical than a steam plant, and investment of 92-103% of that for a steam plant is justified.

Where local load centers can be fed only through long transmission lines because of lack of local water, gas turbines as boosters serve admirably. *(Industrial applications will be discussed in next issue.)* —POWER

LAMPS REDUCE SICKNESS

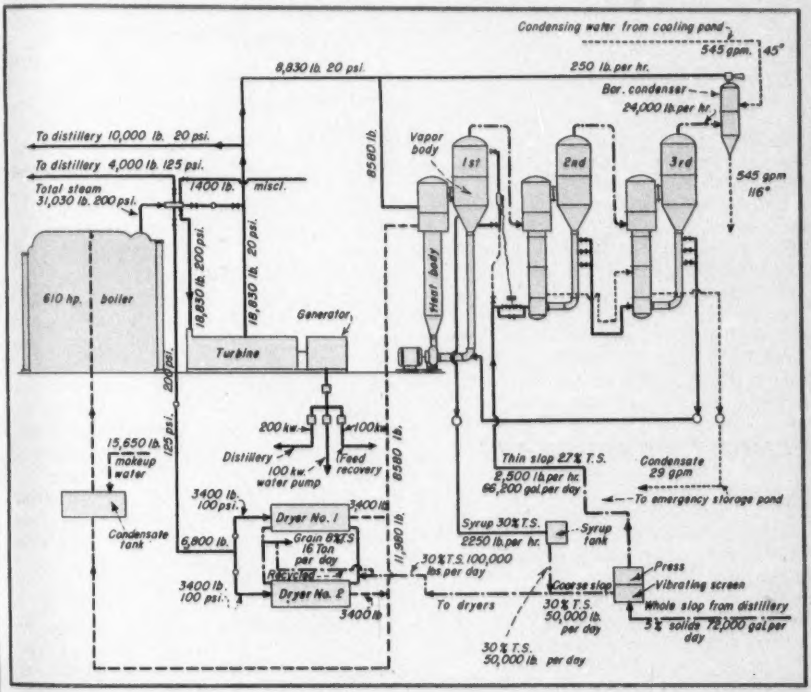
Absences at a Fresno, Calif., elementary school were reduced 75% following the installation of 43 germicidal lamps in classrooms, corridors, cafeterias, and lavatories. Respiratory diseases were responsible for the majority of the absences at the school prior to installation of the lamps. —ELECTRICAL WEST

ASBESTOS-FELT BLANKET PROTECTS DAM FROM FROST

To protect upstream face of a multiple-arch dam from frost damage, a composite protective covering was applied. It included a membrane of 15-lb. asphalt-saturated asbestos felt and two applications of a plastic asbestos cement. Tests for a suitable protective material covered a period of 20 yr.

Beginning at bottom of arch, concrete was cleaned by chipping or brush hammers. Then working down the face, surface was washed with compressed air and water jets. For application of the coating, scaffolds again worked from bottom up, first applying a primer coat of asphalt cutback. On the down trip, a minimum $\frac{1}{16}$ in. of asbestos cement was troweled on.

Then asphalt-saturated asbestos felt was applied. Strips were 33 in. wide, lapped a minimum of 2 in. horizontally and 3 in. vertically. Laps were cemented with asbestos cement. A $\frac{1}{8}$ in. top coating of asphalt cement then was applied. The following year a coating of light-reflecting paint was sprayed on to minimize heat absorption. —ENGRG. NEWS-RECORD



FEED FROM WASTES—Distillery slop from the Old Clover Distillery Co. is now being reclaimed as cattle feed rather than discharging it into a nearby stream. Whole slop enters onto a vibrating, perforated screen (lower right), passes to press. Syrup is mixed with pressed cake and dry grain, then mixture is dried in rotary steam-tube ovens. This is blown into a cyclone unit from which it passes to bulking or bagging station. The distillery waste recovery plant produces 50,000 lb. of cake per day, of which 35,000 lb. is water. —ENGR. NEWS-RECORD

TWO PROBLEMS SOLVED ON HOOVER DAM

Biggest problem in developing Hoover Dam tailrace was disposal of soil. Material from Nevada side was carried to Arizona side by an 800-ft., 30-ton cableway, handling dump skips. From the Arizona bank, below the cableway, a 1,000-ft. double-track tramway was built to a point on the canyon rim 550 ft. above river level. Upper part of tramway, on 50% grade, was in cut and on fill, the lower part on trestle with 75% grade. Two special 15-yd. cars, running opposed as counterweights, at 600 ft. per min., were operated by a 500-hp. mine hoist. From tramway top tipple, four 20-yd. dump trucks hauled the material to dump areas.

In altering four of the tunnel outlets, the most difficult work was removal of 1,850 cu. yd. of old concrete. Blasting was necessary. Procedure was to cut a 40-in. strip in all sides of an area to be removed, isolating it. This strip was then taken out by close drilling 3-in. holes with wagon drills and broaching out intervening webs. Isolated section was shot carefully by light loading drill holes with half a stick of 40% dynamite fired in rounds of 19 holes with delays up to No. 9. Shock to concrete was negligible. —CONSTRUCTION METHODS

TOMORROW'S AUTOMOBILE

American automobile designers see no radical change in car design until supply catches up with demand. But new designs are being developed for the car of tomorrow.

Changes will include: Weight more evenly distributed between axles, with less overhang beyond wheels, to improve riding quality and vision. Windows will be larger; windshields will curve up and down as well as right and left and will extend beyond the corner posts. Automatic transmission will be available in all models. Upholstery will be of plastic, for longer wear and ease in cleaning; sponge rubber will replace springs in cushions. Motors will be more economical, burning high octane gasoline, which costs a little more than present gasoline but gives greater mileage through higher compression. Higher speeds will necessitate more powerful hydraulic brakes. Wheels will be individually sprung. Tires will be smaller and fatter, using less air.

Diesel power will be used increasingly in buses and trucks, but is not a suitable fuel for passenger cars. Steam automobiles may come back.—BUSINESS WEEK

SILT AS FUEL SOURCE FOR POWER PLANT

Silt is to be used as fuel in a Hudson Coal Co. power plant supplying power to several of its collieries. Hudson has a stockpile of 1,500,000 tons built up from 50 yr. of operation. This will last about 10 yr.

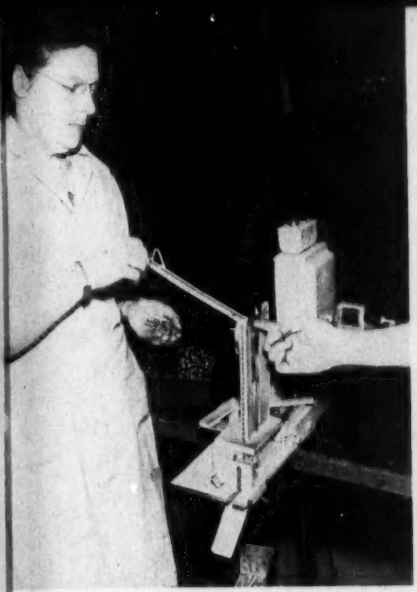
Silt—which runs 75–85% minus 28 mesh, 15–35% up to $\frac{3}{16}$-in.—is cleaned by eight batteries of six spiral concentrators each; six handle primary feed, two handle refuse and middlings from primary concentrators. As water and coal travel down the spiral from primary tank, fine coal tends to "ride up" on the outside lip of the spiral and travels in that position to the bottom of the column. Heavier middlings and refuse tend to fall toward center of spiral, being taken off through 1-in. dia. adjustable openings.

The bottom one or two spirals in the primary separators discharge middlings, which are returned to the primary tank for reprocessing. Upper four or five spirals discharge refuse. In secondary separating, all material taken off through ports is classed as refuse and is not reprocessed.

Concentrators handle water at the rate of 19,000 gpm., carrying 40 tons of coal per hr. Ash content of silt runs 25–40%; recovery, reducing silt to desired 17–19%, is 65–70% of the minus $\frac{3}{16}$-in. feed from primary vibrating screens. —COAL AGE

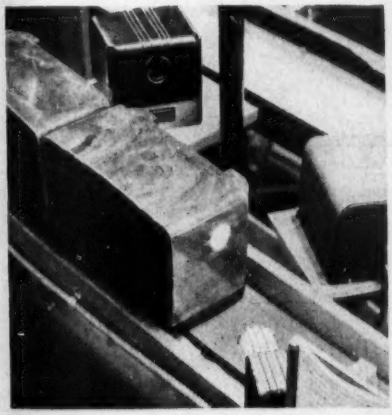
Time Savers

Efficiency is increased greatly at Bendix Radio Div. through use of time-saving devices —Factory

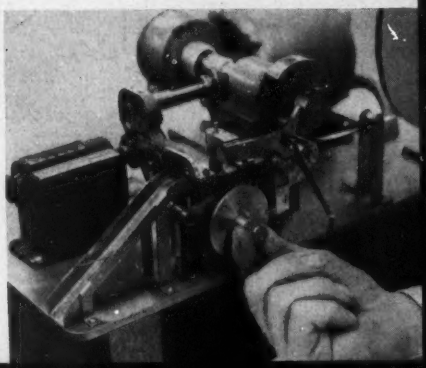


Pneumatic rams now place pulleys on tuning shafts. Misfits are automatically rejected by this machine that takes pulleys as fast as two operators can supply them.

Wooden dollies, mounted on roller bearings, are used in the personal aircraft equipment department to handle assemblies. Cheap, dollies can be used, then discarded.



Photoelectric cells are used widely in the plant. Here the cell permits the conveyor belt to move on after operator at one station picks a cabinet off the line.



This machine cuts ground straps of copper to any length between ⅛ to 4 in. Length of strap is shifted by calibrated dial; pieces are counted automatically.

FRESH FRUIT ESSENCES MADE FOR FLAVORING

Fresh fruit essences now are made by at least one firm and several are working with the process. As developed by a government laboratory, for apple essence, the basic process involves condensing vapors evolved from apple juice during heating, concentrating 10 to 150 fold, and dissolving in water. The resulting delectable liquid holds its flavor indefinitely and will intensify and restore flavor of fresh apple previously lost. Quality fruit and careful processing are required.

The process now is being applied to many other fruits — peaches, grapes, blackberries, strawberries, pineapples, apricots, and sour cherries.

Fresh fruit essences now are used in ices, sherbets, jelly, candy, pharmaceuticals, and as bait attractant. Essences cannot withstand heat.—FOOD INDUSTRIES

BUS VS. PERSONAL PLANE

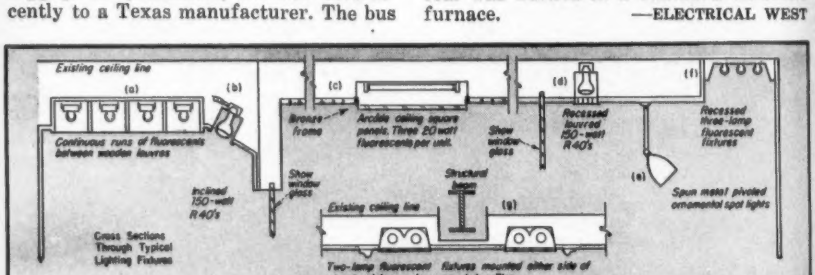
First de luxe, executive-type bus, complete with two staterooms, showers, toilets, washbowls, kitchenette, closets, and luggage compartments, was delivered recently to a Texas manufacturer. The bus replaces personal planes used for the past 10 yr. by the manufacturer to conduct away-from-home business, covering a 1,000-mile area. Bus costs $50,000, compared with $15,000 to $22,000 for planes previously used. Saving will be realized through relatively lower chauffeur pay. Bad weather will not ground bus.

Bus is a joint project of ACF-Brill Motors Co. and Consolidated Shipbuilding Corp. —BUS TRANSPORTATION

HEAT PUMPS PRACTICAL

Mass production methods, plus expected high demand for private installation, may force retail prices of heat pumps well below the current $2,000 selling price (3-hp.), possibly as low as $1,000. Dual role as heater and air conditioner makes the heat pump doubly attractive to home owners. Today units can be purchased in 3- and 5-hp. sizes, some larger. Performance ratio of energy delivered to energy purchased is 4 to 1.

Experiments show that if coal is burned in a central station and delivered to the home by line, line having a 20% power loss, more heat would result than if coal was burned in a standard domestic furnace. —ELECTRICAL WEST



FOOTCANDLES SELL FOOTWEAR—Lighting in new John Ward shoe store in New York effectively displays merchandise and shows up decorative store interior. Cross sections of typical lighting fixtures are shown above. Entrance and accessories ceiling (top center) has 30-in. square diffusing glass panels, each backlighted by three 20-watt, 4,500° fluorescent lamps. Front display case (right) is lighted by a row of recessed 150-watt R40's behind ceiling-flush disk louvers on 24-in. centers; a series of 150-watt spotlights in bell-shaped, spun metal reflectors, 13 in. below ceiling line, on 34-in. centers; and three continuous rows of 40-watt, 4,500° fluorescents in ceiling troffers. A recessed show window (left) is lighted by four continuous rows of fluorescents between 8-in. deep wood louvers and a row of 150-watt incandescent reflector spotlights recessed in inclined sockets. Ceiling-recessed fluorescents (bottom center) are used in remainder of store. —ELECTRICAL CONST. & MAINT.

TRAIN OF TOMORROW—This exhibition 4-car, diesel-electric train, built by General Motors Corp., consists of a coach, dining car, sleeper, and observation lounge car. Each car has a separate power system. Kitchen is all-electric. Observation windows atop cars give travelers an engineer's-eye-view of the route. Cars are equipped with telephones, permitting business men to conduct business enroute. —BUSINESS WEEK

JACKS TEST ROOF TRUSSES AGAINST EACH OTHER

Joints of welded steel trusses, 40- to 50-ft. in length, to be used as roof supports for the new General Electric Co. electronic research and manufacturing center, were tested by hand-pumped hydraulic jacks. The Warren-type trusses, with top and bottom chords of wide-flanged beams with webs vertical, were connected with gusset plates. Placed vertically one above the other, truss ends were supported on steel H-columns.

After loading trusses to one and one-half times design load, hydraulic jacks were placed between spans. None of the welds developed visible cracks. To simplify inspection, welds were white washed to make location of cracks apparent. All test trusses were used in final construction. —ENGRG. NEWS-RECORD

BUYS TOOLS THAT SAVE

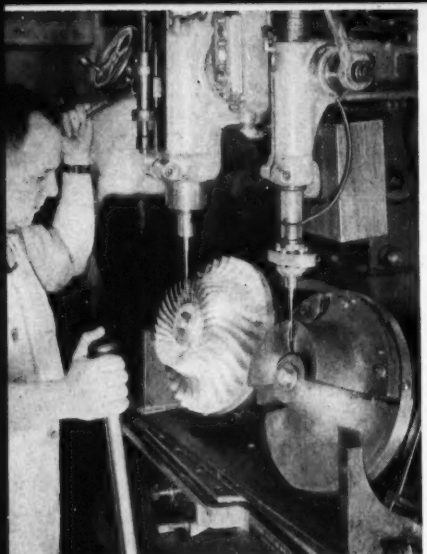
Regardless of its age, an old machine tool is replaced at Crompton & Knowles Loom Works if a new machine will produce a cost saving of 20% when used 75% of the time. This policy is keyed to technological progress. It takes immediate advantage of new machines and processes and puts into practice the plant modernization which so many companies talk about without taking action. It puts modernization on a self-amortization basis and achieves control of manufacturing costs.

In extreme cases, tools are bought if they will save 10% in direct costs when used 50% of the time. Such purchases must be justified by other factors such as saving in floor space or improvement in product. —AMERICAN MACHINIST

EXPLOSION-PROOF SURGERY

To guard against ignition of combustible vapors in operating room when anesthetics are used, special provisions were made in wiring the new clinical building of Dr. Walter Wakelin. Electrical receptacles, switches, and ventilating system are explosion proof. The general lights are vapor proof, and the surgical lamp is connected so as to start room exhaust fan when switch is thrown.

To avoid explosion from static electricity, a relatively new grounding system is used. It consists of a bronze floor box, with watertight hinged cover, which houses six plug-in jacks connected to a grounding bus through ½-megohm resistors. Chains are plugged into jacks and clamped to a person's leg or to equipment. —ELECTRICAL CONST. & MAINT.



PRECISION BY EAR—A tone stylus enables operator of profile-duplicating milling machine to precisely control manual pressure on cutter to protect thin blades of supercharger impeller. Developed by General Electric, the device has a 2-in. stretched tungsten wire which is electronically vibrated at audible frequency. Surrounded by a strong magnetic field, the vibrating wire produces an audio-frequency voltage which is amplified and applied to a loud speaker. Less than one ten-millionth inch change in length of wire due to pressure of stylus against master form produces an octave change in pitch. Operators readily achieved much greater accuracy than is possible by other methods. —AMERICAN MACHINIST

TEXTILE TECHNIQUES

Presence of copper, cobalt, and zinc in the diets of sheep gives the wool a fine crimp. During experiments conducted in Australia, sheep whose diets were deficient in copper were found to have "steely," uncrimped wool. Researchers report that 7½ milligrams of copper per day gives greatest yield and value to wool. . . . The new Bobinier-Intersector and Gills-Frotteur machinery give better control of fibers than porcupine machines through use of straight-line drafting. Closer control of fibers to the nip of the front roller is possible. Drafts up to 7½ are feasible. Two operators are eliminated through use of the machinery on French-worsted yarns.

Because air saturated with smog, coupled with dust and fly from machines, passing through mechanical filters was damaging up to 5% of the yarn at Adelaide Mills, Inc., an electrostatic filter was installed to clean air going to the blowers. Air cleaner has a 10,500-cfm. capacity. Efficiency is 90%, well above that of mechanical filters. . . . Increased production speeds and less handling have resulted from use of continuous bleaching at Dundee Mills, Inc. Low-cost sodium peroxide is used; 100 yd. of rope form goods is handled per min.—TEXTILE WORLD

3-DIMENSIONAL PHOTOGRAPHY READY FOR RELEASE

Three-dimensional photography soon will be released from its secret classification. Douglas Winnek, developer of the process, believes that magazine covers, advertisements, book jackets, and billboards will be using the process in 12 to 18 months. Pictures give observer the illusion of looking around foreground objects, which appear to move in relation to those in background.

Applicable to still pictures, movies, television, and graphic arts, only the process for still pictures has been completed. During manufacture of films, the film is embossed on the base side with thousands of tiny curved ridges, too small to be seen. Each ridge forms a semicylindrical lens known as lenticulation. Ridges break up image into a series of stereoscopic pictures. Ridges act as selecting screen, allowing each eye to see only its respective part of the stereoscopic picture.

Special lens, at least as wide as the interpupilary distance, must be used in photographing the picture. The Navy has been using a 10-in. dia. lens.

To print three-dimensional pictures, a lacquering and lenticulating unit is added to standard machinery. Modification, not yet divulged, is necessary in engraving process. Cost of printing process will be about 20% higher than current processes. —BUSINESS WEEK

British House Easily Erected

Of precast concrete construction, superstructure of two-family unit can be put up in 410 man-hours with unskilled workers; 20,000 to be built

Equal in quality to conventional house, the Airey prefabricated concrete structure—to be mass produced in Britain—is economical of timber, simple to erect, requiring no cranes and little scaffolding. It is a two-family, two-story, semi-detached house with tiled pitched or flat roof, each half measuring 27x19½ ft. A party wall separates halves. Program calls for 20,000 houses; 13,000 already have been built. Components are mass-produced in factories and distributed to rural areas.

A contractor with no previous experience in this type of construction can put up the superstructure of a pair of houses in 410 man-hours. Unskilled erection labor can be used.

There are both North Aspect and South Aspect type Airey houses, both erected from the same standard set of components. The total superficial floor area of the North Aspect House is 945 sq. ft. Outbuildings provide another 118 sq. ft. of area.

The Airey is traditional in structural form. Floor is concrete slab; precast concrete posts and panels take place of timber posts and sheathing, and these are vibrated and reinforced in precision metal molds. Precast units weigh about 36 lb., are easily handled. Wall slabs are secured to concrete posts by copper ties, the vertical butt joint being backed with bituminous composition. The 3-ft. long, 9-in. wide, 1-in. thick slabs are laid dry in courses; they are tapered in section and have dry overlapping horizontal joints.

Windows are metal in timber frames. Vertical uprights of frame continue through window openings, for which they provide the mullions and make load bearing window heads or sills unnecessary.

Internal walls are of aluminum insulating sheet, fastened to uprights. Insulating board is used for the finished internal lining.

Uprights of upper story are connected to corresponding posts below by projecting metal dowels which fit inside each post. Uprights also are bolted to first floor joists and roof members, tying entire structure together. These joists are of light-gage lattice steel, with timber nailing strips for ceiling and floor.

Total weight of precast superstructure for a pair of the Airey houses is about 28 tons. —CONSTRUCTION METHODS

In British prefabricated house, precast concrete slabs are set between concrete posts and anchored by copper wire ties. Picture shows construction of party wall separating halves of the two-family house.

NEW COKE PROCESS UTILIZES LOW-COST COAL

Pittsburgh Consolidated Coal Co. is to construct a $3,000,000 plant to produce low-temperature coke, called Disco. The new process will permit use of low cost, fine-sized coal, instead of high-grade coal used in standard processes. Tar and tar derivatives are important byproducts of the process, the coke being directed toward home heating. The process promises lower raw material costs, lower capital investment, and lower operating costs.

Coal, smaller than ¼-in., is mixed with Disco breeze (refuse) prior to roasting at 600°F. in preheating operation. Mix gives off hydrocarbon vapors at 700°F. and distillation begins. Revolving action of the carbonizer kneads and compresses the soft particles, molding them into spherical shapes of ½-in. dia. These balls are recirculated. Gases driven off are used to heat process.

A ton of coal produces 1,440 lb. of Disco coke, 3,700 cu. ft. of 375-Btu. gas, 15 gal. of crude tar. From 100 gal. of crude tar 28 gal. of tar-acid oil, 19 gal. of fuel pitch, 25 gal. of creosote oil, and 204 lb. of pitch coke pellets are produced. Coke sells for $9 per ton, slightly higher than standard coke.

Proposed plant will produce 27,000 tons of coke annually. Operating economies should cut production costs by as much as 10%. —BUSINESS WEEK

CHEMICAL AIR CONDITIONER

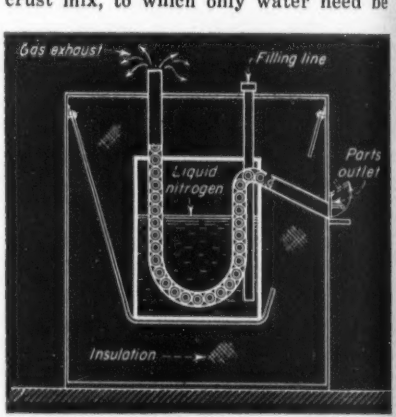
Air is dehumidified and its bacteria content reduced to a low level by the use of triethylene glycol at Seamen's Bank for Savings. A central air conditioning system supplying 300,000 cu. ft. of space furnishes six air changes an hour at relative humidities of 48 to 52%. Vaporizers throughout the system maintain a glycol relative saturation of 60-70% for effective germicidal action.

The glycol is a hygroscopic liquid that absorbs water vapor from the air without adding sensible heat. Then a small amount of refrigeration will bring air temperature to comfort range. Germicidal effect of the vapor has been demonstrated by research studies.

The complete central system consists of a double bank of air filters, dehumidifier, concentrator to restore glycol to full strength, refrigerating compressors, blowers, vaporizers, and automatic control elements. —POWER

NEW FOODS

Mashed potatoes can be prepared in 2 min. by adding salted, boiling water to a package of the dehydrated Idaho potatoes being market-tested by General Foods Corp. Each particle of the dried product is a 1/16-in. dia. tube, ¼ in. long . . . Korn Kurls are made by frying a raw corn meal product and applying cheese and salt. Introduced by Adams Corp., the food competes with potato chips and pop corn. . . Prepared dry pie crust mix, to which only water need be



FOR TIGHT FITS—High-purity, inert, nontoxic liquid nitrogen, with which —320°F. can be obtained, now is available commercially for shrinking machine parts requiring expansion fits. Typical immersion cooler (for valve-seat inserts) is shown. Precooled by gas passing around them to exhaust at top, parts are fed down through the liquid, then they rise to an ejection trap at right. —AMERICAN MACHINIST

added, has been developed by Pillsbury Mills, Inc. . . . Enriched flour, vegetable shortening, dry nonfat milk solids, and salt are blended by American Home Foods, Inc., to produce a hot-roll mix. Dried yeast in a small envelope is packaged with bag of mix. —FOOD INDUSTRIES

NEW ALL-PURPOSE GREASE

One grease soon may replace the five types now used for automobile lubrication. Union Oil Co.'s barium complex soap base oil apparently will fill all lubrication requirements. The grease contains 19% complex barium soap, mineral oil, glycerin, free alkali, free fat, and water. It is resistant to high-temperature operation, severe working conditions, and water. —BUSINESS WEEK

ELECTRICAL EFFICIENCY IN 5TH AVE. SHOP

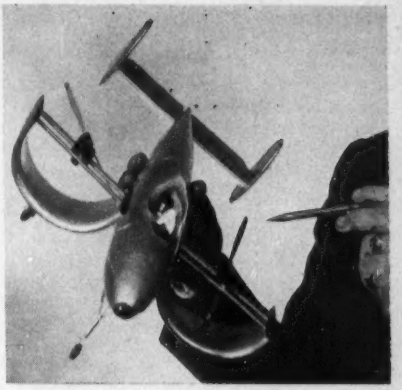
In Lane Bryant's new ten-floor store for women on New York's Fifth Avenue, the ac. electrical distribution system for lighting and power has many advanced features. Continuity of electrical service is insured through the installation of dual distribution, with main switchboard divided into two separate sections serving separate feeders and load centers. Alternate lights on all floors, motors for alternate elevators, and all other major electrical duplication are fed from separate circuits.

Flexibility of showcase and sales-counter arrangements is achieved by connecting the electrical circuits of adjacent cases and counters with connectors, plugs, jumpers, and fittings. By connecting counters together with flexible metallic sheathed jumpers instead of to separate floor outlets, a single floor receptacle serves an entire bay, or series, of units. This permits counters and cases to be shifted for seasonal variety, to meet departmental requirements, and to stimulate shopper interest.

Extravagant use of light, heat, water, and personnel supervision is avoided by automatic controls and magnetic switches. Time switches control lighting in show windows. Thermostats regulate house tank temperatures and operation of unit heaters, fans, and circulating pumps. Remote magnetic switches activate motors in inconvenient or remote parts of building.

Lighting panels on all merchandising floors are divided into three sections to provide separate control of floor and display case lighting, general ceiling lighting, and night lighting. Current is conserved by cutting off, from the basement switchboard, incandescent illumination, local displays, and sales counter equipment at end of sales day. Cleaning and other after-hours activities are performed under fluorescent lamps, which use less current and last longer.

Photocells which operate bell guard against unauthorized use of fire-tower exits. —ELECTRICAL CONST. & MAINT.



CURVED WINGS—Take-off and landing speeds of 10-15 mph. are claimed for the new "channel" wing plane built by National Aircraft Corp. Pusher propellers driven by 75-hp. engines pull air through curved wing at high speed to lift 75% of plane's weight without forward motion. Plane (plus pilot) weighs 1,785 lb., has a top speed of 60 mph. Wing has standard airfoil section. One plane of this type has flown 100 hr., and is now undergoing AAF tests. —AVIATION NEWS

BETTER EQUIPMENT FOR KNITTING MILLS

New machines for knitting mills were featured at the recent Knitting Arts Exhibition. Among them was American Knitting Machine Co.'s automatic feed slitter. When power is turned on, bottom cushion roll and circular slitter blade in center of work table are engaged. Fabric is placed across the cushioned roll, and top roll is lowered. Three tension bars at front hold cloth taut, permitting precision cutting by circular blade. Capacity is 50 ft. per min. of double-border knit goods.

Electronic controls on Cutting Room Appliance Corp.'s laying-up machine for tubular fabrics permit stopping of material at any point from any location along the frame. Operator merely applies pressure to bar running along both sides of table.

Three new rib-knitting machines introduced by Edmos Products Co. have one-feed per diameter inch and utilize multi-disk clutches and gear-driven dials. Machines are: a 13-in., 13-feed, 14-cut Swiss rib operating at 69 rpm.; a 14-in., 14-feed, 14-cut plain ribber, at 40 rpm.; and a 20-in., 20-feed, 14-cut plain ribber, at 30 rpm.

A new machine which produces 600 to 800 yd. of slide fasteners per hour from continuously fed tape and bar stock is made by Jacquard Knitting Machine Co., Inc. Various lengths of fasteners are possible. The company also has a new style LA links-and-links, three-fingered stripper. It is built in 12 to 16 in. and 6, 7, and 8 cut sizes.

For nylon hosiery finishing, Paramount Textile Machinery Co. has developed the new Paramold 29 retort. Automatic timing, easily set temperatures, thermostatic controls, and safer operation are features. Machine has self-sealing door and automatic electric controls.

A new twin-knitter operates at 80 courses per min. through knitting and narrowing, producing a round heel or stocking which can be completed on a Reiner heeler. Welt turning is semi-automatic. It is a Robert Reiner, Inc., development.

Drying from the inside out and from the outside in is the feature of the new Smith, Drum & Co. two-way package drying machine. Drying time is greatly reduced by the machine.

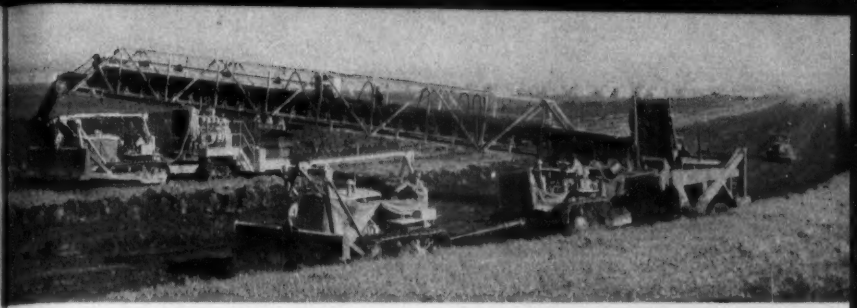
Whitin Machine Works has a new high-speed tricot machine from which hand wheels have been eliminated and control bars and an electric inching device added. Front guide bars can be raised easily for threading. Machine runs as high as 580 courses but 500 is recommended —TEXTILE WORLD

NEUTRAL GROUNDING PAYS IN PLANT POWER SYSTEM

Advances in the design and application of fault clearing apparatus, such as relays and circuit breakers, has resulted in a trend toward the adoption of some form of neutral grounding for industrial electrical systems. Neutral grounding minimizes the number of the more disastrous phase-to-phase faults by making it possible to remove automatically ground faults before phase faults develop. It also eliminates the "cut-and-try" method of ground fault location which must be used on ungrounded systems. Transient voltages, caused by switching or ground faults, can be limited to 250-300% as compared to 500-600% on ungrounded systems. Less equipment damage and improved system operation result.—ELECTRICAL WORLD

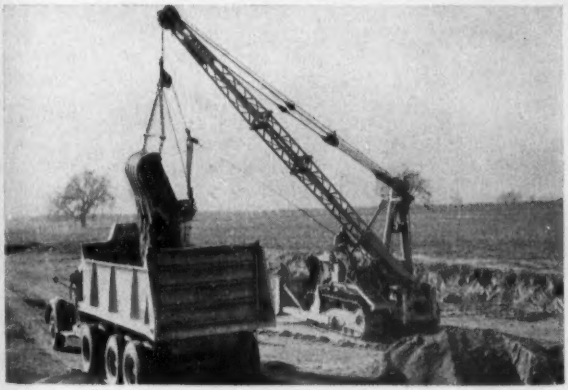
LIGHTWEIGHT BATTERIES

Lead has been replaced by lightweight magnesium in plates of storage batteries built by an English firm. This makes battery operation of many vehicles more feasible. A British company claims to have perfected an electric motor car capable of 50 mph. —PRODUCT ENGRG.



QUICK CANAL DIGGER—Something new in dirt moving equipment is digging 40-mile section of Friant-Kern Canal in California. It is an ingenious combination of new Euclid loader and a travelling belt-conveyor stacker that casts the spoil 100 ft. from point of excavation. Stacker is 100-ft. trussed section carrying 60-in. belt and supported on two swivel-head crawler carriages. One carriage is under a receiving feeder and hopper at one end of stacker; other swiveled carriage carries a roller assembly that engages a track under half the length of the truss. Loader discharges into the hopper. Three tractors are used to pull carriages and loader. —CONSTRUCTION METHODS

For Efficient Construction



HANDY EARTHMOVER — Combination crane, clamshell, and dragline unit, developed by Hyster Co., attaches to rear of Caterpillar D6 or D7 tractors. For D6, rig has 25-ft. boom with safe load capacity of 6,100 lb., handles ⅜-yd. dragline bucket, ¼-yd. digging clamshell, or ½-yd. rehandling clamshell. D7 has 30-ft., 6,600-lb. boom, takes 1½-yd. dragline bucket and ⅝-yd. and ½-yd. digging and handling clamshells. Power is taken from tractor. Rig doesn't interfere with limited bulldozing, is removed for sustained bulldozing, replaced in 2 hr.—CONSTRUCTION METHODS

POWER ROOTER — In fast land-clearing operation, special toothed rooting blade on crawler tractor gets hold on buried stump roots. Power of hydraulic blade lift tears out roots. Winch on rear of tractor drags big stumps to burning piles. —CONSTRUCTION METHODS

FAST SOLDERING—Assembly of watch components by soldering is facilitated at Telechron, Inc., by a conveyor. Two women assemble parts and solder rings, a third slips assemblies onto a rotating spiked belt which carries them past heating torches. Even heating avoids distortion. —AMERICAN MACHINIST

RADAR FOR LIVERPOOL

To be installed at Gladstone Dock in Liverpool, a precision 3-cm. radar unit will permit "talking" ships safely through winding approach channel by radiotelephone in the thickest fog. Five cathode-ray screens installed in a semicircular console will show exact position of all ships and their relationship to buoys. Grid lines on the screens willl enable quick location of any vessel on a chart having corresponding lines.

The five screens will be arranged in special relation to each other. The first will show the entire scanning sector for the 20-mile range of the equipment, and the next four will each show a precision picture in the limited arc and range corresponding to the portion of the channel being monitored. —ELECTRONICS

EXTRACTS CHEMICALS FROM DEAD SEA

Natural salts of the Dead Sea are being recovered by Palestine Potash, Ltd. Solar evaporating pans cover more than 4,000 acres. Sea water, pumped from depth of 175 ft., flows slowly from one pan to the next, becoming more concentrated. Sodium chloride crystallizes and deposits on bottom. In secondary pans, the double salt carnallite ($KCl.MgCl_6H_2O$), with some adhering NaCl, is deposited. After deposition of carnallite, the brine contains all the bromides.

At the plant, the carnallite settles from suspension and is washed with "neutral" brine. Then "decomposition" brine (low in $MgCl_2$) dissolves $MgCl_2$ and leaves KCl behind in fine suspension. The KCl suspended in brine is pumped via mixers to a static classifier where large crystals of carnallite separate from fine ones of KCl and NaCl. The fine KCl suspension is pumped to thickeners, and that portion of brine with large carnallite crystals is pumped to mixers for further decomposition treatment. The two slurries are joined and pumped to elutriators which separate out large NaCl crystals. From this point, the material goes through a continuous 4-drum filter and is washed with decomposition brine, then with light brine to remove NaCl still present. Washes with water and light brine, then with plain water follow. The material is filtered after each wash.

The potash is conveyed to Nutsche filters where suction pumps remove water. Continuous direct-heat drying, cooling, and sacking complete the process.

Brine containing bromine is fed into top of a Kubiersky column in which steam and chlorine are introduced at the bottom, resulting in bromine and chlorine mixtures. After separating, the bromine is bottled. Chlorine is produced by electrolysis of KC1, with KOH as a by-product. —CHEMICAL ENGRG.

SANITATION NECESSARY IN FREEZING COOKED FOODS

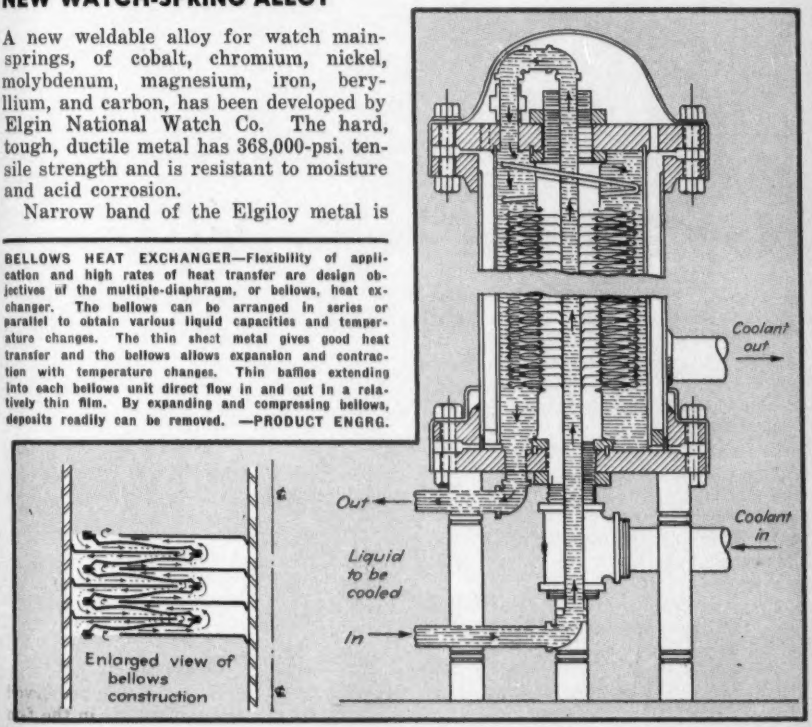
Frozen cooked foods should be looked upon by the processor as potential health hazards. They should be processed and handled in ways which prevent contamination by pathogenic bacteria. Such contamination must be determined. A satisfactory index is the confirmed test for fecal coliform contamination. The factory must be sanitary, free of rodents and other animals, and screened against flies. Continual inspection of the health and in-factory sanitation habits of employees is paramount.—FOOD INDUSTRIES

NEW WATCH-SPRING ALLOY

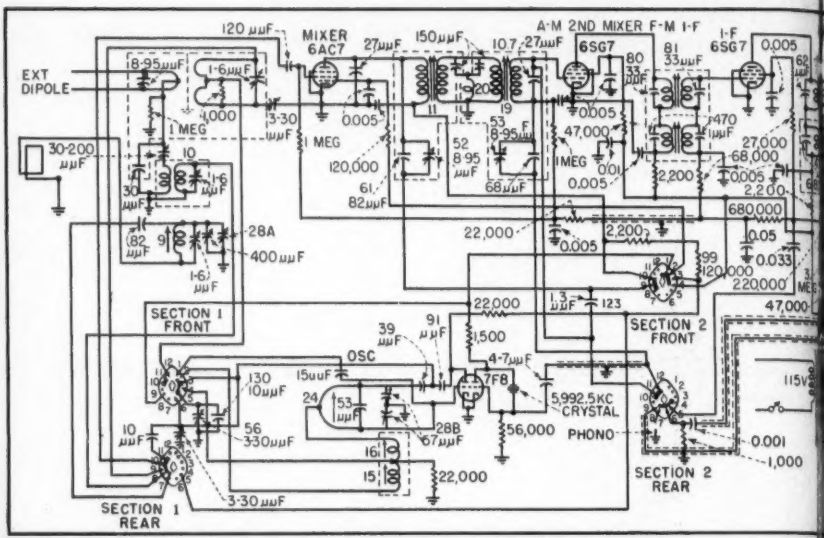
A new weldable alloy for watch mainsprings, of cobalt, chromium, nickel, molybdenum, magnesium, iron, beryllium, and carbon, has been developed by Elgin National Watch Co. The hard, tough, ductile metal has 368,000-psi. tensile strength and is resistant to moisture and acid corrosion.

Narrow band of the Elgiloy metal is fed into slitting machine which cuts band to desired width within 0.0001-in. tolerance. These strips are polished, then recut. In the second cutting operation, machine pierces arbor and barrel hook holes in spring ends. After heat treating, springs are tested, then coiled in the opposite direction to increase their strength.

The 0.0043-in. thick spring is then spotwelded to the 0.0035-in. thick brace in a specially designed template. Lower electrode has a tungsten insert in the copper template; upper electrode has conventional tapered point. It is not necessary to anneal the finished weld of the part. —WELDING ENGRG.



BELLOWS HEAT EXCHANGER—Flexibility of application and high rates of heat transfer are design objectives of the multiple-diaphragm, or bellows, heat exchanger. The bellows can be arranged in series or parallel to obtain various liquid capacities and temperature changes. The thin sheet metal gives good heat transfer and the bellows allows expansion and contraction with temperature changes. Thin baffles extending into each bellows unit direct flow in and out in a relatively thin film. By expanding and compressing bellows, deposits readily can be removed. —PRODUCT ENGRG.



Complete circuit of Crosley 86CR radio, which reflects a new approach to f-m/a-m receiver design. Band switch is in the broadcast wave position; short-wave, frequency-modulation, and phonograph are successively clockwise.

New Ideas in Radio Design

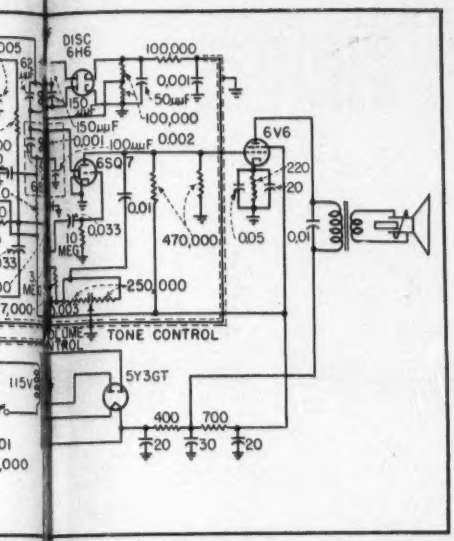
Engineering innovations give unusual performance in 8-tube, double superheterodyne receiver and adapt it to high-speed manufacture

Many unusual engineering techniques are incorporated in the eight-tube, double superheterodyne radio receiver 86CR designed by Crosley Div. of AVCO Corp. It has unusual selectivity and sensitivity and low noise on broadcast, short-wave and frequency-modulated bands. It is simple enough for high-speed production and sufficiently stable to satisfy user requirements, particularly with respect to tuning.

Freedom from spurious responses in the amplitude-modulation bands is obtained without a radio-frequency stage as a result of the double superheterodyne circuit. For the f-m band a conventional single superheterodyne circuit is used. However, the humps of the bandpass curve of the 10.7-mc intermediate frequency, separated by 150 kc., fall on the humps of the discriminator characteristic.

The combination of the two curves produces a linear detection characteristic with steep skirts. As a result, the gain of the i-f stages and the voltage output of the discriminator are higher than normal, and the selectivity is greater than can be achieved with the same components conventionally tuned. No limiter is used.

Low noise is achieved on all bands by cave-in front-end design and is preserved by a 6AC7 high-g_m converter. On the f-m



band, the input circuit is an electrostatically shielded "hairpin" inductively coupled to center-tapped coils. The balanced circuit reduces any reradiation from local oscillator. On broadcast band, low-impedance loop antenna is used.

Indicative of the extent to which parts have been eliminated is the tuning capacitor. It comprises but two variable sections, a split-stator unit for local oscillator tuning and a conventional section for tuning the broadcast-band loop. No tuning is used in the antenna circuits for short-wave and f-m services. These are broadband, fixed-tuned circuits which accept the whole band.

Further simplification in switching is obtained by an unusual local oscillator circuit. The two halves of the split-stator capacitor are connected in series for tuning the f-m band, producing a low capacitance that tunes the single-turn silver-plated oscillator coil, which has a temperature-compensating fixed capacitor soldered to its ends. The solid structure of this assembly, the high-capacitance design, plus temperature compensation, produce a highly stable oscillator.

For tuning the short-wave and broadcast bands, the split-stator unit is connected in the parallel connection and additional inductances are switched to the center tap of the single-turn coil. Both local oscillator connections form Colpitts circuits.

The second oscillator, connected by the switch when in the short-wave and broadcast position, is a crystal oscillator circuit. This circuit requires only two components in addition to the tube—the crystal and a fixed resistor.

In the f-m position of the wave-change switch, the first tube is the mixer, 6AC7, with bandpass tuning and a high conversion gain of 40 times. The local oscillator, one-half of a 7F8 double triode, is tuned through 98.7-118.7 mc., placing the intermediate frequency at 10.7 mc. for f-m. The two following tubes, 6SG7, act as i-f amplifiers with a gain of 50 per stage. Next is a 6H6 double diode in a Foster-Seeley discriminator. The audio output is passed to the triode section of a 6SQ7 diode-triode and then to a 6V6 beam power output stage. Maximum power output is 8 watts.

For a-m service, the double superheterodyne connection is used. The 6AC7 converter, now the first mixer, has a conversion gain of 20 times. The first local oscillator signal is injected into the first converter from the same local oscillator as in the f-m case. First i-f frequency, 5,825 kc., is passed to first 6SG7, now a second mixer, with conversion gain of 50 times. Mixed in this stage is the second local oscillator frequency, 5,992.5 kc., from the crystal oscillator in second section of 7F8 double triode. The 167.5 kc. difference frequency is amplified in second 6SG7 with gain of 175. This i-f signal is demodulated in the diode section of the 6SQ7, and the resultant amplified at audio by the same circuits as in the f-m case.

—ELECTRONICS

TECHNICAL SHORTS

Colors Prevent Shocks—Simple color code to show proper outlets has reduced accidents, speeded machine installation, and lowered maintenance costs at RCA Victor Div., Radio Corp. of America. Solid background colors indicate voltages, diagonal stripes indicate dc. or currents other than 60-cycle. Code is used on all single or duplex outlet boxes, attachment outlets or drop cords, and on switch-boxes within the factory. —FACTORY

Replaces Ore Bins—Conventional storage bins and chutes at portal of a U. S. Vanadium Corp. mine are replaced by concrete-floored loading area with draw hole in center. Standard dumping ramps at track elevation are used to dump Granby-type mine cars onto concrete floor below. Ore is scraped into tracks spotted beneath draw hole, using 50-hp. hoist. —ENGRG. & MINING JOURNAL

Castor Oil Drawing—In deep-drawing stainless steel, Budd Co. is using hydrogenated castor oil. Far more expensive than filled lubricants, it has reduced die maintenance and stamping breakage more than enough to compensate. —AMERICAN MACHINIST

Personal Plane Project—Constructed and now in test phase at Boeing Aircraft Co. is a personal aircraft project engine about the size of a sewing machine. It develops 200 hp., weighs one-third as much as reciprocating engine. —AVIATION NEWS

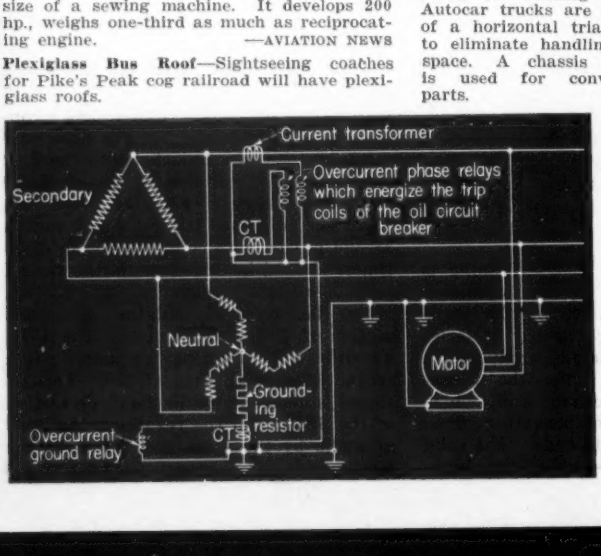
Plexiglass Bus Roof—Sightseeing coaches for Pike's Peak cog railroad will have plexiglass roofs.

Better Evaporated Milk—Research data indicate that the flavor and color of evaporated milk can be improved by reducing the oxygen available in the cans before sterilizing the milk. In reactions causing brown discoloration and cooked flavor of milk, oxygen is taken up and carbon dioxide produced. A correlation exists between these factors and degree of brown discoloration found in milk after heating. —FOOD INDUSTRIES

Speeds Mill Repair—A signal board located in the maintenance shop of E-Z Mills, Inc., shows location and type of breakdown through use of varicolored lights. When breakdown occurs, operator lights bulb on corresponding board in production area, the circuit being connected to a board in the maintenance shop. Since color indicates type of breakdown, a specialist in repair of that equipment can be dispatched. —TEXTILE WORLD

X-rays Predict Oil Flow—By subjecting a 1x3-in. rock sample from an oil field to artificial pressures and saturations of oil, gas, and water, Gulf Oil Corp. determines flow conditions in a stratum. An opaque tracer is mixed with the liquid or gas and x-rays follow its progress. —ELECTRONICS

Production Speedups—Three different wood forms for bending copper tubing used in Autocar trucks are mounted on either side of a horizontal triangular turntable frame to eliminate handling and to save storage space. A chassis turn-over fixture also is used for convenience in installing parts. —AMERICAN MACHINIST



PROTECTS MINERS—This is believed to be one of the most practical type of wiring systems for protecting men in mines against dangerous voltages between machine frames and ground in event of single ground fault. Protection will be lost if another phase wire fault occurs simultaneously. Ground protection of 440- and 220-volt circuits is generally omitted, since protection means excessive equipment costs, but practice is not recommended. —COAL AGE

Speeds Big Gear Cutting—Application of gear shaving to gears as large as 8 ft. dia. has permitted hobbing speeds and feeds to be increased about 50% in a Westinghouse turbine factory. Shaving gives a finer surface than the best hobbed surface, even at slow hobbing speeds. —AMERICAN MACHINIST

Compressed-air Grinder—New grinding process involves circulating material in a circular chamber at very high speeds by compressed air or steam. At desired degree of fineness, particles are removed automatically by centrifugal action. Used by Micronizer Co., the process is considered the most efficient method of reducing dry materials to micron size. —ENGRG. & MINING JOURNAL

Convenient Rod Reel—At American Steel & Wire Co., wire rod from bake house is coiled by rotating head of a standard lift truck then rammed against steel bumber. Coil is thus compressed from 9 ft. to 6 ft. in length, facilitating transportation of wire rod within plant. —FACTORY

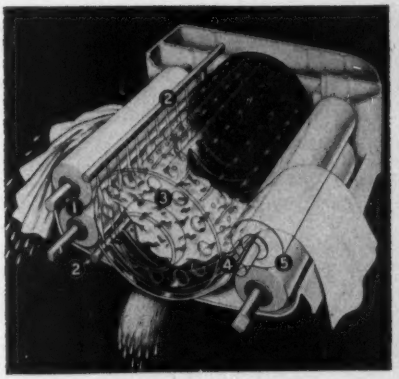
Rubber-filled Propeller—A propeller designed by B. F. Goodrich Co. has a thin metal shell filled with sponge rubber. Propeller, which has passed flight tests, is as strong as standard propellers, but much lighter. —AVIATION NEWS

Press Cuts Threads—Punch presses, hydraulic cylinders, or other straight-line power units can be used to drive a rack which turns a gear to rotate a tap for high-production work. The tap is screwed in and out in one cycle to complete the work. Spindle which carries tap should be threaded to whatever thread is being tapped. It then acts as leadscrew. —AMERICAN MACHINIST

Photocell Controls Furnace—Photoelectric cell in duct between sander dust-collecting cyclone and blower delivering dust to furnace burner controls damper which regulates air flow for proper combustion in U. S. Plywood Corp. plant. Damper directs air to furnace or recirculates it through cyclone as required. Photocell and amplifier operate solenoid valve to control hydraulic damper motor. —POWER

Safe Welding—Welding fumes from each welding station at Erie Meter Systems, Inc., are sucked up by overhead exhausts and expelled through overhead stack. Individual exhausts can be regulated by welder. Overhead lights are of sufficient candlepower to permit seeing outline even with shield down. —WELDING ENGRG.

Cheap Gas Storage Tanks—National Tube Co. is converting 24-in. dia. pipe lengths into natural-gas storage tanks by crimping ends to form a 40 ft. container. Capacity of tanks is 25,000 cu. ft. of gas under 2,240-lb. pressure. —BUSINESS WEEK



RINSES CLOTHES "SCUM-FREE"—Clothes are rinsed "scum-free" in the new ABC-O-Matic washer, manufactured by Altofer Bros. Co. Continuous shower of running water floats away loose dirt and soap fat. Rollers squeeze clothes, soapy water being returned to washer unit. Then clothes are sprayed from top and bottom. Floating cylinder submerges clothes in a continuously changing bath, then damp-drying rolls discharge clothes. Load is rinsed in 3 min.—ELECTRICAL WORLD

Buses on Suspended Jigs—Use of suspended jigs for bus body subassemblies at Kenworth Motor Truck Corp. is saving many man-hours in assembly time. Jigs are bent to shape on plaster model and can be adjusted to worker level, eliminating reaching, bending, or crawling. Two-point suspension eliminates vibration of jig. —BUSINESS WEEK

Better Apple Pie—Sliced apples may be firmed to improve pie texture by dipping or cooking in a 0.1 to 1.0% solution of calcium chloride which jells pectin in apple. Air must be removed from slices before dipping. Treated slices may be used directly, or be canned or frozen. —FOOD INDUSTRIES

Replica Surface Analyzer—Surface roughness can be evaluated by applying transparent plastic film, stripping it off, and then oscillating it in a beam of light directed at a photoelectric cell. The light transmitted varies with roughness and causes a pulsating photocell current, which is read on a meter. National Bureau of Standards developed the technique. —PRODUCT ENGRG.

Phenomenal Insulator—Soviet scientists report discovery of a new electric insulating material with an ultra-high dielectric constant exceeding 1,000 and reaching 10,000 under certain conditions (constant for mica is 10). It is barium titanate, expected to find wide use in radio and other high-frequency circuits. —ELECTRICAL WORLD

Use of Powdered Metal Gains

"Hot pressing" process reduces necessary pressures, cuts equipment costs. Nonconducting metal-plastic magnetic material announced at exhibit

New techniques and applications in the use of powdered metals—in which parts are made by compressing powdered metal in dies to desired porosity and heat-treating or sintering to desired strength—can produce parts at costs comparable to those for standard methods, in some cases lower. One advantage is the ability to gain specialized properties in parts unobtainable in standard processes. Currently, about 2,500 tons of powdered metal is used annually in the United States, but output may reach 12,000 tons in 1948.

Price is still a problem. Iron powder now sells for 8-12¢ per lb.; finished iron powder products sell for about $1 per lb., depending upon complexity.

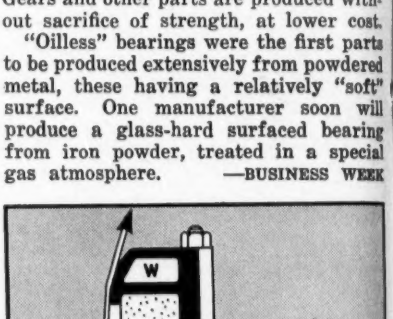
An interesting process is used in manufacture of manganese gear sets. Ingots of metal are used instead of powder, the ingots being ground into powder during the process instead of placing the powdered metal directly into the dies.

Normally, pressing is done at room temperatures, followed by heat treating in a gas atmosphere. But relatively low room temperatures require higher pressures, thus more expensive equipment is required. "Hot pressing" reduces pressures and equipment costs. Stronger, denser parts result. The process is widely used in making tungsten carbide parts.

Shown at the recent Metal Powder Assn. meeting in New York was a nonconducting magnetic material, made by pressing metallic powders containing up to 20% thermoplastic resins. Magnets of this type are just as strong as standard magnets, yet weigh one-third as much. Material is now being used in automobile speedometers.

Ford Motor Co. is using powdered metal to produce exact-size parts, the powder being forced through an extrusion plate around a core rod. High dimensional accuracy, laterally, is attained. Restriking or coining is unnecessary. Gears and other parts are produced without sacrifice of strength, at lower cost.

"Oilless" bearings were the first parts to be produced extensively from powdered metal, these having a relatively "soft" surface. One manufacturer soon will produce a glass-hard surfaced bearing from iron powder, treated in a special gas atmosphere. —BUSINESS WEEK



SPEEDS RAYON SINGEING—Singeing speeds have been increased 4 to 16 times at Fair Lawn Textile Co. through installation of radiant flame-compression burners. Mounted one above the other, the 61-in. burner includes: two index cocks, two firechecks, two water valves, one main gas-and-water valve, two pressure governors, two carburetors, and two turbo compressors. Cloth forms one side of combustion burner. Cloth, on roller mounted on lower burner, first passes lower burner, then it is reversed to singe other face at burner above. Cross section shows water-cooled heads (W), refractory (R), flame (F). —TEXTILE WORLD

PRODUCTION CONTROL CUTS COSTS 35%

Simple and flexible in operation, a new production control system at Wheatherhead Co. is expected to cut costs 35% in an operation handling 40,000 small machine parts. Advantages to the system: it permits determination of accurate delivery dates from machine-load charts; relieves production-control personnel of purely clerical functions; furnishes up-to-date information on tools and raw materials; permits prompt decision on salvage and scrapping of parts rejected by inspection; allows operation on predetermined schedule; puts control of performance in hands of foremen; cuts setup time by scheduling jobs in a sequence requiring slight setup changes; combines sales order on form; and assures delivery to production of latest drawings, routing, and incentive rates.

Duplicate copies of production order contain all information from master folder, three pages being identical, the fourth page varying according to the department to which it is issued. Control rests primarily with parts copy, departmental file copy, and closeout copy. When one department finishes its operation, foreman fills out closeout copy and sends it to next department. Receipt tells foreman that materials are enroute. As work progresses, back of parts copy carries materials rated as substandard. File copy carries notation of all work for cost and accounting sections.

When job is completed, parts copy goes back to production control. Then all blueprints, routing, and tools sheets are destroyed to eliminate the possibility of duplication of orders. —FACTORY

LIFT CUTS PORTAL TIME

Installation of a standard passenger elevator at Hanna Coal Co. has greatly reduced walking time between wash and change room and working areas. Underground travel has been shortened 4 miles.

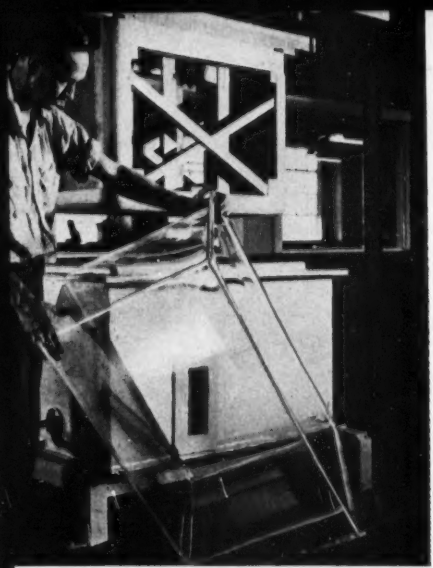
STEEL ROOF CONSTRUCTION—In steel roof construction developed by Donald Hamilton, London, light steel purlins are bolted to light channel rafters in form of ladder. Sections are handled by one man. Insulating material is laid directly on purlins. —CONSTRUCTION METHODS

Shaft, starting just outside wash and change room, ends within 200 ft. of main haulage way. Elevator is a standard 5x11-ft., 3,500-lb. capacity lift, traveling the 181-ft. distance in 22 sec. The 185-man main shift is transported one way in 12 min.

The pushbutton controlled, gearless-traction lift is powered by a 190-volt ac. motor operating at 127 rpm. —COAL AGE

REDUCES FREIGHT SHOCK

Shock and vibration, chief causes of freight car damage and roadbed repair, will be minimized by hydraulic shock absorbers on cars, reduction of shock running up to 93%. Absorbers for all types of freight cars, similar to absorbers used on coaches and passenger cars, have been designed by Monroe Auto Equipment Co. —BUSINESS WEEK



LOW-COST FORMING—Sheet plastics can be formed in production quantities for such parts as laboratory tanks by inexpensive skeleton wood molds. In this "ridge forming" technique developed by Rohm & Haas Co., the mold contacts the heat-softened plastic only at major shape-determining points. As a result, finishing costs have been curtailed greatly by elimination or reduction of subsequent polishing. Small quantities of different designs are economical. AMERICAN MACHINIST

METAL-CERAMIC SEAL—MAJOR ELECTRONIC ADVANCE

Magnesium-silicate ceramics are superior in electrical and physical properties to glass for the precision manufacture of microwave electronic tubes. Problem of obtaining a permanent hermetic seal between the ceramic and metal or other ceramics has been solved—a major advance in design and construction of many well-known microwave tubes. Areas to be soldered are painted with a mixture of powdered titanium hydride in a suitable carrier. The ceramic can then be soldered like metal by heating to 900–1000°C. in vacuum or pure hydrogen. Pure silver, eutectic silver-copper alloy, or any metal melting in this temperature range can be used.

Supports and spacers can be attached to tube structures by the technique. Wiring circuits may be permanently attached to ceramic chassis units and subassemblies by printing the circuit on the ceramic part with paint made of titanium hydride and powdered copper or silver, then firing in a suitable atmosphere. —ELECTRONICS

EXPLOSION-PROOF ELECTRIC UNITS FOR AIRCRAFT

More explosion-proof electric units will be required in future aircraft designs. It is unsafe to assume that dust-tight equipment is satisfactory for hazardous locations.

Most self-cooled aircraft motors and small control devices can be made explosion-proof by adequate flame paths, with little or no weight increase. Control assemblies of relatively large free volume can be made explosion-proof by vents, with only a small percentage weight increase.

Availability of porous metal for venting should open an approach to explosion-proof design. —AVIATION

DISPLAYS SELL IDEAS

Using window space to sell ideas rather than simply presenting merchandise is the new display practice among electrical merchandisers in Washington. In advertising an electric range, the merchant emphasizes money saved by the unit rather than the unit itself. The program is the result of research studies carried out by the Electrical Institute of Washington. — ELECTRICAL WHOLESALING

MAY CURE FILARIASIS

Compound 863, a cyanine dye, may be a cure for filariasis, tropical disease transmitted by mosquitoes. The orange-red dye is used as a sensitizer for photographic emulsions. Injected into diseased rats, the dye poisoned the parasites without injuring the rodents. Last fall, the School of Tropical Medicine, San Juan,

P. R., gave injections to 27 diseased humans. Direct results can not be determined through inability to look into lymph vessels. —BUSINESS WEEK

REVOLUTIONARY DRILL

Small-bore rock drilling may be revolutionized by drill bit with tungsten carbide inserts. Jackbit pierced 25–30 ft. of granite per min. compared to 12–14 ft. for steel bit, with 33–50% saving in air consumption. It drills 250 ft. before dulling, compared to 2-3 ft. for steel bit. It holds gage for entire length of average hole, so starting diameter is same as final required for charge. Ingersoll-Rand will produce it. —CONSTRUCTION METHODS

NEW MATERIALS, MACHINES IMPROVE PACKAGING

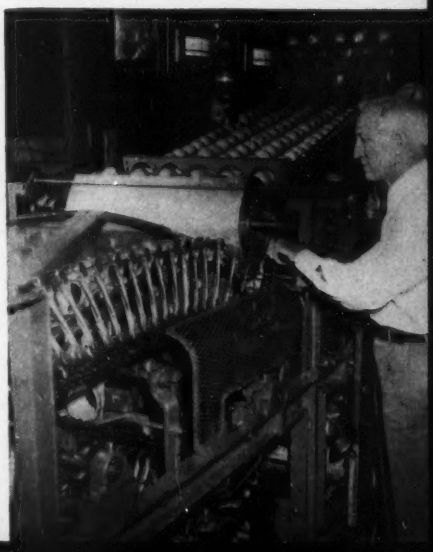
Important new uses are being made of plastic films and coatings for packaging foods. Tough, odorless, tasteless, transparent, and pliable over a wide temperature range, the new Saran 517 film has low moisture-transmission rate and is a good oxygen barrier. Consumer packaging of natural cheddar cheese, to prevent oxidized surface flavor, is one of its first applications. Nonfogging Pliofilm containing wetting agents as modifiers disperses moisture in a continuous layer. The moisture is absorbed and transmitted to the interior atmosphere, with the result that the film remains transparent.

New insulated containers with Pliofilm liners are used to ship prechilled (32° F.) fresh seafoods by airplane. Polyethylene film has been used by Bakelite for packaging fruits, vegetables, and turkeys. Vinylite resin-coated packages are used for frozen foods and prepared food mixes.

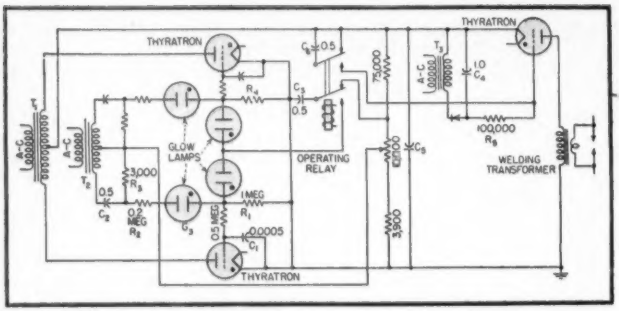
Pliofilm sheet is stretched around oranges by a new Curtiss Candy Co. machine at rate of 800 per min. at cost of 1¢ per orange. The wrappers reduce weight loss and spoilage. Two sheets of Pliofilm, softened by heated rolls, are gripped by fingers on cam tracts on both sides of machine and stretched to six times original size, then fed over revolving cupped drums. Suction draws film into cups, and oranges drop into cups and are sealed between two sheets of film. On cupped conveyors, surplus film is trimmed by heated wires and removed by revolving brushes.

Stokes & Smith has developed a Stretch-Paker for wrapping products ranging in size from a turkey to the smallest item. The machine also vacuumizes the packages.

Filled packages are checkweighed continuously and underweight or overweight packages ejected from the production line by the new Weightrol of Fred Goat Co., Inc. A drift indicator shows how far the average weight has shifted from the assigned average. Filling machine performance is recorded on a continuous chart in office. —FOOD INDUSTRIES



New machine wraps 800 oranges per min. in Pliofilm to reduce weight loss, spoilage.



Circuit of capacitance-type spot welder, for light-gage metals, in which stored energy level is precisely controlled by electronic means.

SPOT-WELDING ENERGY PRECISELY CONTROLLED

In a compact spot welder for light-gage sheet metal and wire, the stored energy level of 225 watt-sec. in 200 microfarad of capacitance is accurately controlled by simple means. Grid-controlled thyratrons (see diagram) rectify output of supply transformer and charge capacitor bank. Grids are controlled by voltage drops across resistors R_1 and R_4 as a result of currents in grid circuits consisting, for example, of a glow lamp G_3, resistor R_3, a phase-shifted alternating voltage, and a reference direct voltage, all in series. As capacitor bank gains charge, the instantaneous sum of dc. reference voltage and ac. phase-shifted voltage exceeds flash voltage of glow lamp. Voltage builds up across grid resistors to cut-off point of thyratrons. Cut-off is gradual, never reaches zero, and trickle charge maintains exact preselected voltage across capacitor bank.

A grid-controlled thyratron, which is fired by the operating relay, discharges the stored energy to the welding transformer. —ELECTRONICS

NEW FLYING BOAT DESIGN

Featuring long, lean, hull lines, the new 400-mph. jet-powered flying boat to be built by Convair for the Navy will be approximately the size of the 150,000-lb. *Mars*. Designed by National Advisory Committee for Aviation, the hull will reduce water drag about 50%. Planing tail eliminates the second step and thick fuselage in conventional models, and an exceptionally deep main step gives unusual stability during take-off and landing. —AVIATION NEWS

WAREHOUSE EFFICIENCY INCREASED 60%

Delivery to warehouse, sorting of products by type, and final shipment is accomplished at Kellogg Co. by belt conveyor, conical sorting tables, and fork-lift truck pallets. System increases warehouse efficiency 60%, lowers unit costs, raises shipping speed 12%.

Practically all hand work has been eliminated. Warehouse inspector removes damaged cases as they pass off production line, before they go onto conveyor belt leading to the warehouse. The double belt connecting production and warehouse is ½ mile long, housed in a steel shed 20 ft. above ground. The two conveyors empty onto two conical sorting tables in the warehouse. Table revolves slowly, cases riding around on the perimeter of the 30-ft. dia. Sorting crew varies from two to five men, depending upon volume of delivery from production. Cases are sorted and placed on pallets, which are moved to storage area by a fleet of sixteen 3,500-lb. capacity fork-lift trucks. —FACTORY

Ultra-Precision by Grinding

Bores ground to such accuracy that lapping and honing are unnecessary. Special machine design and temperature control are involved.

Precision to five millionths of an inch and smoothness to half a millionth have been obtained in internal grinding of bores. And the holes have been roughed and finish-ground in one chucking, using the same wheel.

Early investigation of ultra-precision grinding at Bryant Chucking Grinder Co. proved that the standard conception of a grinding machine had to be changed. The ways were redesigned, and ball sleeve bearings on hardened cylindrical slides were used for wheelhead and cross slides. Workhead and wheelhead spindles were accurately aligned. To avoid chatter, the spindles were mounted in special precision bearings and statically and dynamically balanced.

Vibration is eliminated by mounting a precision machine on a suspended concrete block.

Temperature control of room and coolant are required. The coolant is refrigerated to 68°F., and it is circulated through the wheelhead to maintain machine temperature. Hydraulic oil for operating the machine likewise is kept at 68°F.

Surprisingly, surface finish is controlled by alignment and stability of the machine rather than grit size. A 60-grit wheel gives as fine a finish as an 80- or 100-grit wheel. An open-structure wheel, which requires less pressure, does not deflect spindle, is a cooler and more free-cutting wheel.

The new technique has been tested in diesel injectors, bearing races, pump bodies, drawing dies, and ring gages. In each case, required tolerances have been attained. In tests at Springfield Armory, a ground ring gage had a "surface finish equal to or better than most gage blocks." The surface is equivalent to a lapped one in accuracy and wear resistance. A group of tungsten-carbide wire-drawing dies have outworn previous lapped dies by five to one. —AMERICAN MACHINIST

ALUMINUM SHIP

Engineering and design work has been completed on first aluminum cargo ship. Hull will be 40% lighter and will carry about 20% more than steel freighter of similar displacement. To be built for Aluminum Co. of America, ships will have S-61 alloy keel, frames, deck, bulkheads, superstructure, hull. Only steel member is stern frame. —PRODUCT ENGRG.

ALL-IN-ONE-KITCHEN—Stove, sink, refrigerator, and storage space are combined into this 4 x 2 ft. x 81 in. all-in-one kitchen. Stove is either gas or electric. Ventilation system draws air through louvers below sink, past stove, and discharges into outside flue. The $600 efficiency kitchen is made by Parsons Co. —SCIENCE ILLUSTRATED

Effective Bus Maintenance

Any successful system must include a workable plan, accurate records, and thorough training of maintenance personnel. GMC plan does all three

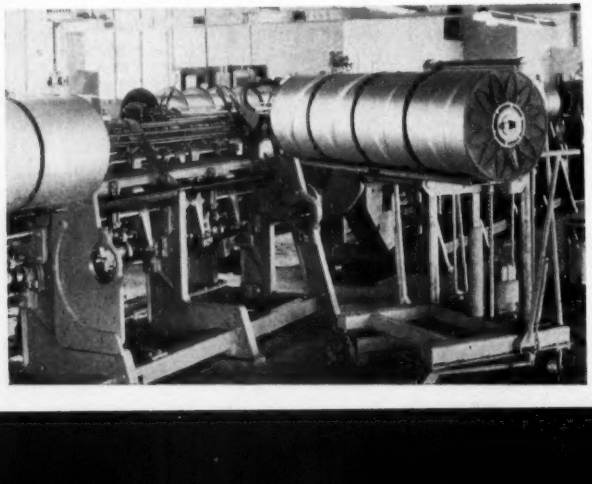
Any successful preventive maintenance plan for bus operation must cover three points—a workable plan, tailored to size of the bus fleet; accurate forms, serving both as direction to worker and as unit history of bus; and thorough training for maintenance personnel. General Motors Corp. Truck & Coach Div. has evolved a system taking all three phases of maintenance into consideration.

Based on daily and mileage-interval inspection, the plan keeps buses in top mechanical condition. Points of safety, economy, and appearance are checked daily. This inspection includes: pit inspection, points underneath vehicles; incoming shift inspection, covering engine, engine compartment, and transmission; and interior inspection, covering interior and exterior of the bus and the driver controls. One man or a team of men completes these inspections, the routine being planned to avoid duplication of work. These daily inspections are the foundation of the system.

Through proper training, these inspections will take a minimum of time for completion, most of the work being done during refueling period.

Using 1,500, 3,000, and 15,000 miles as starting points, additional inspections of coach component parts are scheduled. During these inspections, electrical systems, chassis and brakes, engine and transmission, and lubrication system are checked. The work is scheduled in sequence to minimize lost motion and backtracking. Electrical-system inspection covers all of the electrical system not checked in the routine daily check. Chassis and brake inspection is more intensive than the pit inspection, the air system, wheels, propeller shaft, steering mechanism, brakes, and wheel alignment being checked. Engine and transmission check insures that those parts of the system checked daily receive more intensive scrutiny. Since lubrication is the source of most bus failure, this system is given a detailed and complete check.

Forms and records for these inspections must be simple and efficient. In preparing the schedules, simplicity, flexibility, and accuracy are of prime im-



UPS TRICOT PRODUCTION—Use of 21x21-in. beams, handled four at a time by hydraulic beam lift trucks, has speeded production at the Ko-Nit Textile Co. plant. Beams are run on a 600-end warper at speeds of 450-600 yd. per min. After beams are run, they are placed on wagons four abreast. Beam shaft is then inserted and hydraulic lift truck carries them to machine. Truck, mounted on casters, has three-dimensional movement, needs only 5-ft. aisles. —TEXTILE WORLD

portance. Every inspection must be outlined on a worksheet of some sort, if only as a guide or worksheet for the worker. This will insure that all points are checked. One face of the sheet gives inspection sequence, bus identity, type of inspection, and bus history. The reverse side carries details of the inspection.

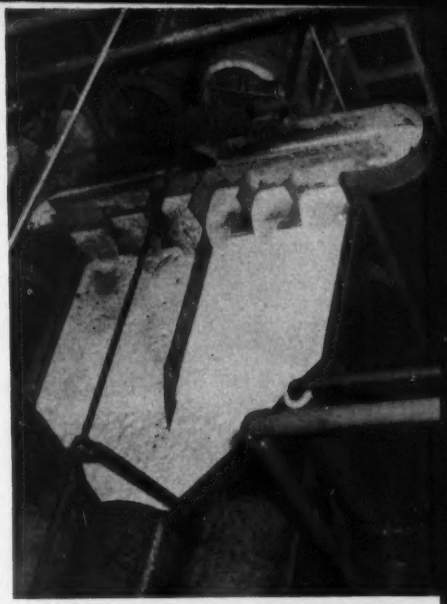
Training phase of inspections is not neglected in the system. Training aids have been developed and are used. Seven slide films cover each inspection step by step. To supplement the film, booklets show detailed pictorial reproductions of the inspections, again step by step, with detailed printed matter accompanying the illustrations. Booklets are retained by personnel. —BUS TRANSPORTATION

FROTH FLOTATION PROCESS CLEANS VINED PEAS

Commercial application has demonstrated the value of froth flotation for removing troublesome foreign materials from vined peas. By controlling the wetting properties of a water solution, it is possible to wet out selectively sound peas from other materials. The easily wet peas will sink in such solution, whereas less easily wet material tends to float. Finely divided air bubbles, dispersed through the solution, increase the buoyancy of the foreign material. Natural differences are increased by treating the mixture with a light mineral oil, thereby increasing the efficiency of the separation.

To accomplish efficient cleaning in a single passage through the separator, a preliminary treatment of the peas with an oil emulsion, similar to the separation solution, is required to condition the surface of the material. Pipes or flumes are used to accomplish this wetting. Separation tanks should have a 30-deg. slope of the bottom surface. The units usually are in pairs, with two sinker outlets and a single floater dewatering wheel.

Oils found to be most satisfactory for use in preparing emulsion have an initial boiling point of about 400° F. and Saybold viscosity at 100° F. of 30-35. It appears that alkyl sodium sulphates, in which lauryl group predominates, are most satisfactory when used with an automatic regulator.—FOOD INDUSTRIES



Vined peas are separated from foreign material by this commercial froth flotation unit. It has twin dewatering reels (background) and twin spreading flumes and separation tanks. In foreground are floater (center) and sinker dewatering reels.

REVERSE-CURRENT PLATING

Finishing costs are reduced 20% and a better finish obtained by a new electroplating process developed by Westinghouse Electric Corp. Current is reversed periodically to remove surplus or unsound metal, level peaks, and polish. It is possible to produce a plate that is considerably smoother than the surface to which it is applied. Burned electrodeposits, nodules, exaggerated buildup of metal at corners or at sharp points—common in other plating methods—can be reduced or eliminated. Little or no polishing is required. —PRODUCT ENGRG.

NEW PRODUCTS

Hot Valves—For free flow of viscous materials, valves can be heated by electrical devices introduced by Sta-Warm Electric Co. Heating element is cemented to valve, enclosed in heat insulation. Control is by adjustable thermostat. —CHEMICAL ENGRG.

Compact Refrigerator — From 25 to 50% lighter than comparable reciprocating models, a small, compact, rotary refrigeration unit introduced by Frigidare Div., General Motors Corp., weighs 85 lb. Compressor has two moving parts — impeller and divider block. It and motor are housed in a cylindrical case. Condenser is mounted on ring-shaped refrigerant receiver and wraps around assembly. Concealed fan circulates air. —ELECTRICAL WORLD

Damage-proof Crusher — When unbreakable material enters Allis-Chalmers Type R reduction crushers, pressure in hydraulic system increases. This compresses a gas-filled bag which permits oil to enter steel shell of automatic reset and causes crushing head to lower and release the hard object, then return. —ENGRG. & MINING JOURNAL

Pushbutton Borer—Wheels are bored in 5-step automatic cycle with the new 48-in. hydraulic unit of Niles Tool Works Div., General Machinery Corp. After feed dials are set, one pushbutton initiates automatic chucking, another starts table. Automatic boring and chamfering cycle begins when small lever is pushed. An electric hoist handles wheels on an off table. —AMERICAN MACHINIST

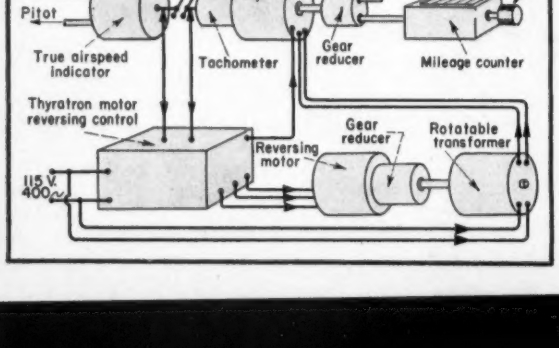
Cinema-size Color Television—RCA Labs. has developed a projector for color television on a 7½x10-ft. screen. Three elements in the reflective system are fed by three projection-type cathode-ray tubes used for simultaneous color transmission. —ELECTRONICS

Accordion Hangar Door—Made of heavy, plastic-impregnated canvas, a new 10x40-ft. folding hangar door is fire and weatherproof and is easily opened. It is in two sections which slide along cables. Material acts as a soft bumper to prevent wing damage on entrance or exit. The door was introduced by BEP Development Co. —AVIATION NEWS

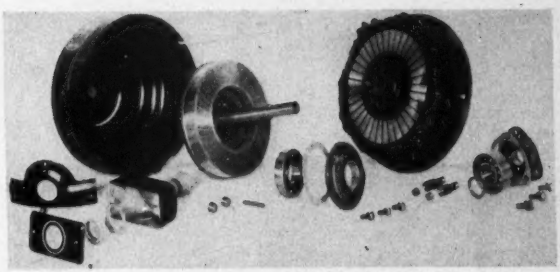
8-gun CR Tube—Designed for special industrial and medical applications, a new cathode-ray tube registers eight independent or transient phenomena on a single 7-in. screen. The type 728P11 tube was developed by Electronic Tube Corp. —ELECTRONICS

Fine-finish Plywood—Plywood with a smooth, relatively hard durable surface which will take a fine finish for either inside or outside construction has been announced by Douglas Fir Plywood Assn. The wood will withstand soaking, boiling. —CONSTRUCTION METHODS

Handy Filter Press—Each frame latches individually in elevated position to permit quick, easy removal of filter paper and cake from new stack press of Walter Kidde & Co. After lowering into position, frames are tightened by hand screw. Filter area is 31 sq. ft.; cake space, 2 cu. ft. —FOOD INDUSTRIES



COUNTS AIR MILES—In Kollsman air mileage counter, electrical contact arm replaces pointer on speed indicator. A mating contact is carried by pointer shaft of motor-driven magnetic-drag tachometer whose scale is linear with rpm. If contacts are open, control motor runs in direction which increases output of rotatable transformer. This increases tachometer motor speed and advances contact until it touches airspeed contact. Then control motor reverses, to open contacts, and cycle is repeated. Speed of tachometer motor is proportional to airspeed, so total of revolutions is proportional to air mileage. —AVIATION



AXIAL AIR GAP — Less than half conventional size and 30% lighter, axial air-gap motors of 1/3 to 10 hp. have been introduced by Fairbanks, Morse & Co. Inspecting, cleaning, and lubricating are easy. Development of "inside" frame, in which supporting members of stator also support bearings, solved assembly problems and gap tolerances. —ELECTRICAL WORLD

Sands Irregular Surfaces—Using 12 brush-backed abrasive strips, 2½ in. wide, the new Sand-O-Flex Corp. sander will finish regular or irregular surfaces. Strips are fed out from an internal cartridge and forced onto surface. Various grits and grades, scored or unscored, are available in aluminum oxide or garnet cloth. Sander is adaptable to a flexible shaft, buffing and polishing shaft, electric motor shaft, or metalworking lathe. Sander weighs 7½ lb. —WELDING ENGRG.

Carbon-film Resistors—Low-capacity, low-inductance resistors consisting of very thin film of vapor-deposited carbon on ceramic base are made by Western Electric Co. They are available in inert-gas-filled glass envelopes or covered with baked varnish. Values are 1 to 50 megohms; power ratings 0.5 to 600 watts. —PRODUCT ENGRG.

Prepared Atmosphere—By partially burning natural, artificial, or propane gas, a unit announced by Bellevue Industrial Furnace Co. generates prepared atmosphere for sintering powder metal and bright annealing. Sizes range from 350 to 60,000 cu. ft. per hr. —AMERICAN MACHINIST

Direction Potentiometer—Low-cost position indication of rotary-beam antenna or other rotating device is obtained with the new Ohmite Mfg. Co. Model RB-2 direction-indicator potentiometer. Shaft is connected to rotate with antenna, then potentiometer is connected to 6-volt battery and a milliammeter. Antenna's position is read from scale. A 6-volt ac. source can be used with dc. meter incorporating dry disk rectifier. —AVIATION

Temperature Watchman—Fifteen thermostats located in different buildings operate a central Detecto Master control unit which rings a bell, lights a red lamp, and indicates on a meter dial the location of a fire. As many as 300 auxiliary thermostats can be wired into a single area; the thermostats may be utilized to warn of damaging temperature changes in cold-storage rooms. Lord-Tabor Co., Inc., developed the alarm. —ELECTRICAL CONST. & MAINT.

Flooring Absorbs Sound—A 3/32-in. layer of vinyl compound bonded to a resilient base of synthetic impregnated cork provides a sound-absorbing floor tile with cushioning action. Flooring is not affected by acid, alkali, oil, grease, moisture, or cleaning fluid. Called Plastile, it is available in 8½x8½-in., 9x9-in., and 35x35-in. sheets, in wide color range. It is a U. S. Stoneware Co. development. —BUSINESS WEEK

Improves Drying Oils—Holding promise as a material for upgrading natural drying oils, sorbic acid is now available in limited quantities from Carbide & Carbon Chemicals Corp. This 2-4-hexadienoic acid is a white crystalline solid of 99% purity.—CHEMICAL ENGRG.

Photoelectric Pilot—Designed for attachment to conventional hand steering gear, a photoelectric pilot automatically steers 20-50-ft. vessels. Heart of system developed by Marine Div., Kirsten Pipe Co., is a binnacle unit which directs operation by changes in power unit. Course is determined by a pilot house control. —ELECTRONICS

Mechanical Fire Alarm—Requiring no special wiring, batteries, or installation, a low-cost, mechanical fire alarm is activated by a spring, set off by bellows-type thermostat. Critical temperature is 130°F. It is a product of Scots Guard, Inc. —BUSINESS WEEK

Automatic Mercury Clutch—Air compressors without pressure-release valves can be started automatically with a new clutch which permits driving motor to reach full speed before load is applied. Centrifugal force acting on a small amount of mercury produces hydraulic pressure against the friction shoes. Clutch is made for motors up to 15 hp. by Mercury Clutch Corp. —ELECTRICAL WORLD

Power-lift Dump Box—For use with its fork trucks, a drop-bottom skid dump box has been introduced by Automatic Transportation Co. As box is raised, steel loops at upper rear corners hook over pegs at top of truck uprights. As forks are lowered, hinged bottom opens. —AMERICAN MACHINIST

NEW PRODUCTS

Measures Angular Rate—For measuring angular rate, a new dc. rate gyro has take-off element of ac. reluctance type operating at 115 volts, 400 cycles. Output sensitivity is 0.49 volts per angular deg. per sec. Dc. motor element operates through 24-32 volt range. Governor controls speed to ±1% over ambient temperatures ranging from −65 to 160°F. Operating input currents are 0.3 amp. dc., 0.02 amp. ac. Gyro precision is limited to one plane. It is a Fairchild Camera & Instrument Corp. development. —AVIATION

Spread-on Flooring—New plastic composition flooring material for houses includes sawdust, asbestos, binding chemicals, and color. Said to be strong and resilient, Oaktred is mixed with water on site and trowled onto subflooring or concrete to minimum thickness of ¾ in. It can be sanded smooth, scored, and varnished or shellacked. Color is medium oak. Kompolite Co. introduced the new flooring. —CONSTRUCTION METHODS

Strap-on Thermostat—Fastened to pipes by straps, a new bimetal thermostat controls water, steam, and chemical temperatures within 15°F. differential. Adjustable range is 40 to 210°F., voltage rating, 110-220 ac., wattage, 1,200 in resistance load and 300 on induction load. United Electric Controls Co. makes it. —ELECTRICAL WORLD

Corrosion Preventives—Oil-soluble liquid suited to treatment of oil and gas wells to inhibit corrosion is announced by Tretolite Co. Called Kontol 115, it is a surface active agent and builds up a thin film on metal surface to prevent corrosion by brine or condensate. —CHEMICAL ENGRG.

Ion Water Softener—Ordinary tap water is said to be transformed to the chemical equivalent of distilled water, at a fraction of the cost of distilled water, by an ion exchange demineralizer developed by American Cyanamid Co. The 60-gal. per hr. Filt-R-Stil requires no heat, steam, or auxiliary equipment, takes only 6 watts. —FOOD INDUSTRIES

Nylon Lock Nut—Using a molded nylon insert as the locking element, a new self-locking nut has withstood up to 200 removals without losing its effectiveness. It is made by Nylock Corp. —PRODUCT ENGRG.

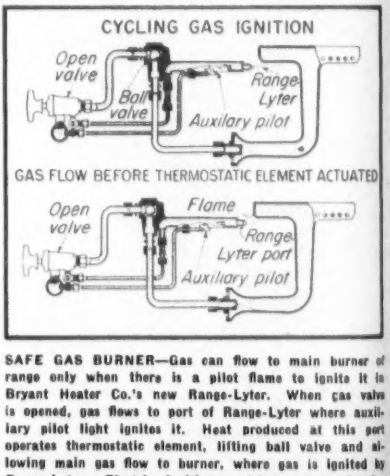
2-in-1 Vacuum Recorder—Dual range of 0 to 0.4 microns and 0 to 500 microns is provided in the new Model S instrument of Geo. E. Fredricks Co. An ionization gage is used for the 0-0.4 range and a thermal gage for 0-500. —CHEMICAL ENGRG.

Hydroelectric Lathe—New Hydroelectric automatic lathe chamfers and cuts off parts made from pipe, tubing, or bar stock. In two sizes for 3- and 4-in. dia. stock, the machine operates either as full-cycle automatic (30 cycles per min.) or single-cycle manually controlled machine. A geared pump delivers oil for rapid traverse slide movements and for the hydraulic control circuit, operated by adjustable dogs on slide. Sliding gear clusters and pick-off gears provide 72 spindle speeds, from 85 to 1,100 rpm., in this Bardons & Oliver, Inc., machine. —AMERICAN MACHINIST

Better Textile Comb Box—Type C ball-bearing comb box, factory lubricated for 2 yr., is designed to fit either left or right on any current make of carding machine. Comb-stock adjustment is said to be made easily from exterior of box. Friction, heat, chatter, and wear are eliminated. Comb box is a Southern States Equipment Co. development. —TEXTILE WORLD

Glass-rubber Hose—Steam hose now is made from spun glass yarn bonded to a rubber tube and cover. Introduced by Goodyear Tire & Rubber Co., it will carry 388°F. saturated steam at 200 psi. under continuous flexing, and can be used for fighting oil refinery fires. —PRODUCT ENGRG.

Six-in-one Plastic Level—Made of Plexiglass, the new Lawco Plastic Products Co. level indicates six different angles. It is lightweight, sturdy, shock resistant. —BUSINESS WEEK



SAFE GAS BURNER—Gas can flow to main burner of range only when there is a pilot flame to ignite it in Bryant Heater Co.'s new Range-Lyter. When gas valve is opened, gas flows to port of Range-Lyter where auxiliary pilot light ignites it. Heat produced at this port operates thermostatic element, lifting ball valve and allowing main gas flow to burner, where gas is ignited by Range-Lyter. Electric ignition model has hot wire instead of pilot flame. —PRODUCT ENGRG.

New Fulling Mill—Of stainless steel construction with air controls, the new Rodney Hunt Machine Co. fulling mill is easily cleaned and maintained. Main-roll pressure is maintained by pneumatic controls, exact pressure being insured by gage control. Packing-box pressure is pneumatically regulated by air cylinders on packing box clapper. Packing box is plastic for insulation, is lined with stainless steel. Extra heavy roller chain drive to side countershaft is 25-50% more efficient than former drives. —TEXTILE WORLD

Boltless Battery Terminal—New battery connector without nut or bolt is electrically tight, nonlocking, and nonfreezing; it fits any size post. Adjustable stainless steel screw, fitted with a Phenolite bushing, moves two cams to provide equal pressure around post. Connector lasts life of car. It is a development of Thomas & Elton Products, Inc. —BUSINESS WEEK

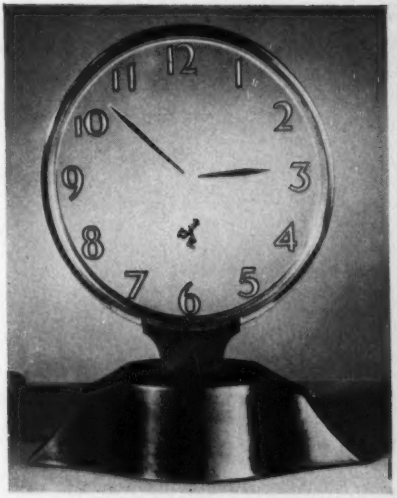
Powder Metal Contacts—Made by the powder metallurgy process, silver-molybdenum electrical contacts developed by Gibson Electric Co. have high arc-resisting characteristics and combine hardness with good conductivity. They are suitable as arcing tips in air or oil circuit breakers and as contacts in other oil-immersed apparatus. —ELECTRICAL WORLD

Takes Moisture from Air—Developed for cargo holds of ships, Cargocaire Engrg. Corp.'s package-type air dryer has been modified for industrial use. It has dual solid absorbent towers, one being reactivated while other operates. Operation and reactivation are automatic. There are 10 sizes—20 to 13,750 cu. ft. —CHEMICAL ENGRG.

Deaerates Foods—Dissolved or occluded air is removed (98-99%) instantaneously from liquid and semi-liquid foods by Chain Belt Co.'s new Rex Micro-Film deaerator. Food is introduced into a vacuum chamber in extremely thin streams and portion vaporizes as it strikes walls of chamber. Deaerator is automatically controlled by pneumatic-type precision instruments and air-operated control valves. —FOOD INDUSTRIES

"Black Light" Borescope—A 100-watt "black light," one third the size of a cigarette, and a specially designed borescope permit inspection in previously inaccessible places. Both are Magnaflux Corp. developments. Surface to be inspected must be prepared with Zyglo or Magnaglo. Inspector views fluorescent indications through borescope with black light at viewing head. —AVIATION

Prevents Corrosion—One coating of Zincilate is said to prevent corrosion and fouling on ferrous pipes, interiors of water or gas tanks, machined parts, and marine equipment. It was developed by Industrial Metal Protectives, Inc. —BUSINESS WEEK



MYSTERY CLOCK—Made of four layers of glass, the new Rex Cole, Inc., clock is transparent, has no apparent driving mechanism; first glass layer has numerals painted on back, second carries minute hand, third the hour hand, and fourth serves as back. Second and third plates have gear toothed edges, are driven by a self-starting synchronous motor housed in the oak-finished plastic base. Layers are held by chromium ring. —SCIENCE ILLUSTRATED

Holds 4 Tools on Lathe—Designed to reduce setup time in lathe work, a toolpost turret developed by Crozier Machine Tool Co. holds four tools and is indexed manually. Pre-location is determined by a detent mechanism. —AMERICAN MACHINIST

Knee-action Needle—Nylon knee between aluminum shaft and sapphire jewel tip of the Webster-Chicago Corp. phonograph needle absorbs vertical horizontal shock, reducing surface noise. —ELECTRICAL MERCHANDISING

FREE SERVICE TO READERS

As a special service to our readers, McGraw-Hill Digest will furnish, without any charge, additional information about any new product or technical development described in this publication. Inquiries are welcomed. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. —*THE EDITORS*

Shortcuts Save Office Time

Simplified office procedures introduced. Longhand memos often faster than dictation; temporary files save space, time; multiple forms efficient

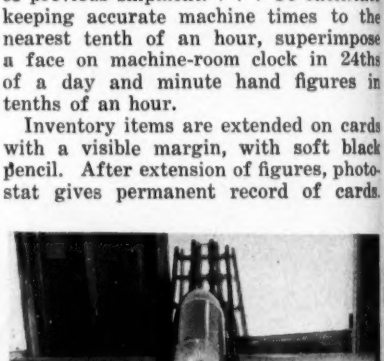
Time saved in offices is as important as that saved on production lines. So National Office Management Association has compiled about 600 practical, time-saving practices now in use throughout the United States. Among them are:

It often is quicker to write memoranda longhand rather than dictate them to a stenographer. To facilitate making carbons, pads with four ruled sheets, in different colors, and with one-time carbons inserted, can be used. If only one carbon is desired, two remaining sheets can be used for next memo. . . . Use of printed post cards to acknowledge a letter requiring time to obtain necessary information saves inquirer worry. . . . Appointment of a staff member to take charge of turning out unnecessary lights will result in a 10% reduction in electricity consumed. . . . Sheets used in looseleaf binders should be numbered backwards, thus the current sheets appear on top.

Needless accumulation in files can be controlled through use of a "temporary" file, into which material of questionable value is placed for periods up to two months. If not needed in that time, papers are discarded. . . . Correspondence which must be filed as long as two years should be kept in battery files, upper two drawers containing current correspondence, lower two drawers holding last year's correspondence. Thus current material is more accessible. . . . To mark material removed from files, an octagonal card, slightly larger than the filed material, is recommended. Since several points of the octagonal card will always be in view, files can be checked quickly for missing material.

A multiple shipping order form, consisting of an office copy, a salesman's copy, a statistical copy, and a seven-part section for shipping, enables part of an order to be shipped without loss of order or duplication of items shipped. First three sections are provided with continuous carbon paper, the shipping department copies being furnished with strip carbons. As a unit of the order is shipped, that item is removed from the shipping forms and forwarded with shipment. Next shipment will carry identity of previous shipment. . . . To facilitate keeping accurate machine times to the nearest tenth of an hour, superimpose a face on machine-room clock in 24ths of a day and minute hand figures in tenths of an hour.

Inventory items are extended on cards with a visible margin, with soft black pencil. After extension of figures, photostat gives permanent record of cards.



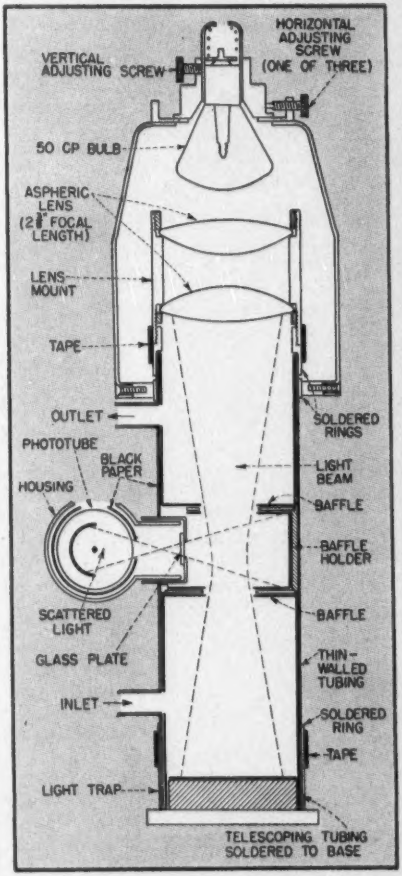
BRITISH ROCKET PLANE—Exhibited in London after successful completion of full-range flight trials, this radio-controlled rocket is of orthodox monoplane design. Maximum speed is more than 500 mph., and 267 mph. is attained in 2 sec. Fuselage is 7 ft. 5½ in long. Fairey Aviation Co. designed the craft. —AMERICAN MACHINIST

Soft eraser will remove current inventory for future use of cards. . . . Printing "Special Delivery" just above body of a letter, instead of only on envelope, will insure prompt reply to letter. . . . A card stating "last collection has been made" and dropped in outgoing boxes after last pickup will eliminate danger of letters remaining in baskets over night.

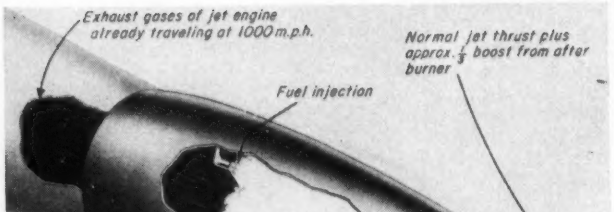
Multiplicity of cards or necessary copying of data is reduced when a single order card is adopted for production orders, with space provided for cost accounting. When production is started on order, the single card is forwarded to cost department for figuring, then filed for reference. . . . Changes for lists are made quickly and easily by rubber stamp rather than posting in each office. Clerk from service department travels from office to office stamping change. . . . At the first of the year, a list is compiled of all subscriptions to be charged to one department, signed by department head, and forwarded to purchasing agent. The list then becomes the authority for payment of bills without referring each separate bill to the proper department head for clearance.

One section of a combination purchase and requisition form is used for specifications of items from which purchase order can be compiled. Another section has space for vendor information. Balance of card is used for recording requisition requirements and purchase data. . . . Typing of order and invoice information, on identical forms, using carbon and "ditto" carbons, reduces time for form completion considerably. Six copies are made at one time, invoice master and order master are made with ditto carbon to facilitate reproduction. Other copies with standard carbon are for sales office (2), salesman, and customer.

By using carbons of all checks, carbons can be stapled to invoice to eliminate need for entering check number on invoice. In answering inquiries, it will not be necessary to check with bookkeeping to get date of payment, check number, or discount information. . . .



SENSITIVE TO SMOKE—Designed for rapid and highly sensitive tests on smoke filters, this photoelectric photometer can be adapted to many industrial problems. The amount of light scattered by smoke is picked up at right angles to the light beam and measured by a phototube and dc. amplifier and a null-point indicator. A potentiometer in circuit can be calibrated directly in terms of scattered light intensity, or smoke concentration. Photometer also is applicable to dust or colloids. —ELECTRONICS


Exhaust gases of jet engine already traveling at 1000 m.p.h.
Normal jet thrust plus approx. ⅓ boost from after burner
Fuel injection
Combustion
Turbo-jet engine

BOOSTS JET THRUST—This Ryan Aeronautical Corp. turbojet afterburner, now ready for flight testing, is in effect a ram-jet engine in exhaust stream of a turbojet tailpipe. It consumes unused oxygen from turbojet and may increase thrust one-third. Advantages: saves fuel, often sustained thrust increase over moderate periods, does not increase frontal dimensions, is light in weight, has no moving parts. —AVIATION NEWS

Checks in triplicate, with one-time carbons inserted by printer, save entry of check information on ledgers. Original goes to vendor, second copy is used to record day's expenditures, and third copy is filed alphabetically for cross reference. Third copy, if printed as a voucher, will save additional time. . . . To eliminate an accounts payable ledger, a file, indexed by vendor's name and address, is advisable. As material is checked against order, items are approved for payment. Delivery tickets also are placed in the folder, and folder moved to "paid" section of file. . . . Separate salary cards for each employee will eliminate pay-period salary sheets. Space should be provided for each pay period, gross pay, deductions, and net pay. Vertical columns can be totaled at year's end.

Standardized forms should be used for reporting production data from various sections. Forms should be prepunched for insertion in sectional folder so each period's figures line up with master sheet. Subtotals are entered on the monthly production report as indicated on the master sheet, and comparison and base figures are available.—*"Manual of Practical Office Short Cuts," McGraw-Hill Book Co.*

HOW TO LOCATE OPTICAL CALCITE CRYSTALS

In prospecting for optical calcite crystals, recent experience indicates that the practical rules to follow are these:

1. Favorable areas comprise the middle to upper series of Tertiary volcanic rocks, at or near centers of hot-spring activity.
2. Calcite veins, usually outcropping prominently, should be minutely examined for transparent Iceland spar float.
3. Once float is found, digging should be concentrated on the soft and low spots nearby, in or on the sides of the vein outcrop.

All occurrences of the crystals in northern Mexico are found in open fissures, or vugs, within or close to the walls of calcite veins or chimneys. In most cases, the vein filling is opaque massive to crystalline calcite with minor amounts of opaline silica. Crystal of optical or suboptical grade has been found only as holomorphic crystals lining the walls of open fissures. There fissures may be completely open or partially filled with fine white "caliche," resembling flour, or by red clay. In a few cases, crystal growth inward from the walls has closed the opening. Uniform crystals up to 500 lb. have been found. Mining is with hammers, moils, gads, and bars. —ENGRG. & MINING JOURNAL

Trends in Power Generation

Tendency is toward higher pressures and temperatures and one boiler per turbine. Popular turbine-generator speed is 3,600 rpm; hydrogen cooling preferred

Power plants in the United States are experiencing their most gigantic growth rate in history of central station industry, the goal being 16 to 20 million kw. of new capacity by end of 1951. In new installations, trend is to higher steam pressures and temperatures. Fewer units are being built for pressures below 600 psig. and more for pressures above 1,200 psig., with the most favored pressures ranging from 800 to 1,000 psig. Use of temperatures below 750°F. is declining. Three units reported will be designed for 1,050°F. Temperatures of 900 to 950°F. continue popular.

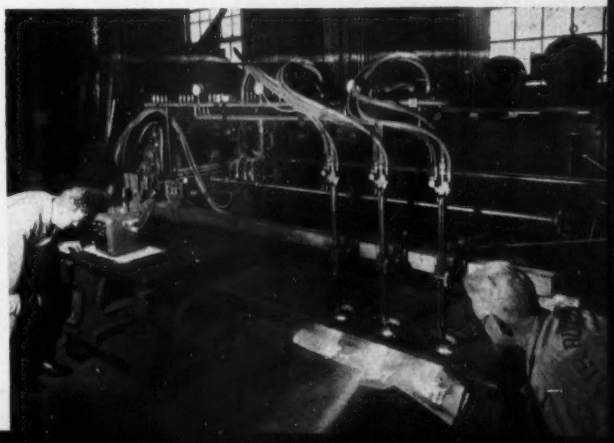
Largest turbine-generators reported are two 150,000 kw. units; from these, capacities range down to 3,000 kw. About 60% are less than 50,000 kw. Only six of the units are 1,800 rpm; two 3,000 rpm; the remainder, 3,600 rpm.

Of 81 units reported, only five are topping turbines; the others, condensing machines. As many as eight bleed points will be used on at least four machines, but four points continues to be most frequently used. Of 80 generators, only 12 are air cooled, the others using hydrogen. In the air-cooled group there are one 75-mw., one 50-mw., and one 15-mw. generator, the remainder being less than 10 mw.

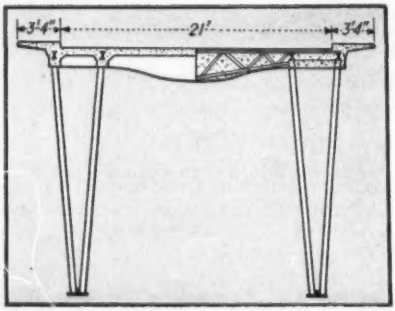
There is a trend toward single boiler per turbine designs for greater flexibility in capacity. Of 80 installations, 58 have one boiler per turbine; 20, two; only two have three boilers. Largest steaming capacities reported are two boilers of 1,000,000 lb. per hr. each; smallest is 45,000 lb. About 65% of the boilers reported are 375,000 lb. per hr. and smaller.

Furnace heat releases for all types of firing average about 22,000 Btu. per hr. per cu. ft. Of 102 boilers, 59 are pulverized-coal fired; seven, stoker fired; remainder burn oil or gas or a combination of these with pulverized coal. Two boilers are fitted with cyclone powdered coal burners.

About 54% of the steam generators have both air heaters and economizers;



ELECTRIC-EYE TORCH — Outline drawing on paper is followed by photoelectric tracing head to control oxyacetylene flame cutting of metal parts. Tracer and electronic control can be applied to most standard pantograph cutting machines. Accuracy to a few thousands of an inch is attained with this device, developed by Air Reduction Co. and General Electric Co. Operation of steering motor is controlled by 3/32-in. light spot projected from tracing head, reflected from drawing, and picked up by two phototubes. Reflection is strong from white area, weak from black.—PRODUCT ENGRG.



Cross section of bridge with concrete top chords, showing absence of transverse bracing below deck.

45% have air heaters only; 1%, no auxiliary heating surface. Tubular air heaters predominate to the extent of 55%; regenerative types are fitted to 41% of the boilers and remainder are plate type.

Electric-drive continues for all auxiliaries, with a few exceptions where turbine drives were installed exclusively for boiler-feed pumps. Hydraulic and magnetic coupling applications still are a minority.

Hydroelectric plants, like steam plants, are experiencing an unprecedented construction boom. More than 3,150,000 hp. of new capacity is on order and being installed in the U. S., over 80% by the federal government. —POWER

METAL-SPRAY RADIO CIRCUITS

Metal-sprayed electronic circuits are used in the manufacture of medium-wave radio receivers in Britain. The spray is applied to a flat plastic base molded with recesses and webs so shaped that the filler metal performs the functions of wires, resistors, inductances, and capacitor plates. The radio is completed by insertion of tubes and electrolytic capacitors, mounting loudspeaker, and assembling cassis in cabinet.

Automatic process produces a sprayed unit every 20 sec. —ELECTRONICS

CONCRETE BRIDGE CHORDS ELIMINATE BRACING

Reinforced concrete top chords with diagonal web membranes of structural steel were used in a 473-ft., 3-span bridge at Tordera, Spain, eliminating transverse bracing below deck. Diagonals are V-form; all fabrication was done by arc welding.

Trusses are of fish-belly shape, arc of lower chord being an ellipse rather than a parabola, minimizing secondary stress as well as evenly distributing loads on diagonals. V-form gives better stability to webs against buckling, eliminates secondary and lateral flexural stresses, permits omission of all transverse wind bracing below floor. Diagonals have a closed box section fabricated from two welded U-shapes. Reinforcing for each top chord is part of structural steel system, consisting of two I-beams connected by light lateral bracing. Floor-beam reinforcing is a light truss, serving as a strut between main braces during erection. —ENGRG. NEWS-RECORD

NEW ROOF, NO DELAY

An arched, corrugated-metal roof was replaced by a 400-ft. long, 80-ft. wide butterfly-type steel and wood roof without interruption of production at a Pittsburgh Plate Glass Co. plant. New columns were placed for new roof, then 24-in., 80-lb. steel rafters were placed by air tuggers and snatch blocks. As soon as decking and 55-lb. felt base sheets had been laid, wreckers removed arched roof, two gin poles supporting chord of bowstring trusses at quarter points during this operation. —ENGRG. NEWS-RECORD

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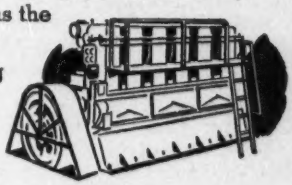

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The principal aim of this book, Number 2 of the *M.I.T. Radiation Laboratory Series*, is to point out in non-technical form the advantages and limitations of various types of radar as aids to the solution of various problems encountered in navigation and pilotage. These types include airborne, shipborne and ground-based systems. Radar beacons and other auxiliary equipment are also discussed.

TECHNIQUE OF MICROWAVE MEASUREMENTS

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